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History and methods of Government regulation of Railway safety in Great Britain,

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Introduction.

Her Majesty's Government of Great Britain exercises technical supervision of the safety aspects of railway construction and operation through an Inspectorate, formerly responsible to the President of the Board of Trade and since 1919 to the Minister of Transport.

The functions of the Inspectorate can be divided into the following main heads :—

(*a*) Statutory approval of new physical works on railways carrying passenger traffic.

(*b*) Accident investigation, including the holding of formal Inquiries.

(*c*) Technical advice to the Minister on general railway matters.

The jurisdiction of the Minister under past regulatory Acts affecting safety has not been altered by the nationalisation of the railways, and the duties, responsibilities and independence of the Inspectorate remain unchanged.

This work is undertaken by a very small staff consisting only of the Chief Inspecting Officer of Railways and three Inspecting Officers, together with one Senior and three other Railway Employment Inspectors responsible for investigating personnel accidents.

Legislation.

The history of the Railway Inspectorate goes back for more than 110 years, almost to the birth of railways in England, for it was in 1840 that the State found it advisable to exercise through the Board of Trade some measure of responsibility over railway working. Only 10 years earlier GEORGE STEPHENSON'S famous locomotive the « *Rocket* » had set the seal of future success on this new system of land transport at the opening of the Liverpool & Manchester Railway, and thereafter railways began to spread with remarkable rapidity throughout the land.

The first Parliamentary inquiry into

railway questions in general was made in 1839 by the appointment of a Select Committee on Railway Communications. This body considered that some governmental control of railways was necessary but thought that interference with their working should be kept to a minimum. In 1840, therefore, an Act of Parliament was passed which incorporated the Committee's general recommendations and authorised the appointment of the first Inspecting Officers of Railways under the Board of Trade. Their duties were to inspect new railways and to report on construction and equipment, while the Companies were required to notify all accidents involving personal injury. A curious feature of this Act was that it empowered any officer or agent of a railway company to seize any of the railway servants found to be drunk or doing anything likely to imperil the safety of working.

The first Inspecting Officers were drawn from the Corps of Royal Engineers, which has supplied all their successors in unbroken line to the present day.

In 1842 a further Act was passed which remedied some of the defects of the earlier one. It directed the railway companies to report all serious accidents whether attended with personal injury or not, and it enabled the Board of Trade, after inspection, to postpone the opening of a railway if its condition was considered unsatisfactory. GEORGE STEPHENSON strongly supported the Government in these measures and recommended that all new works and proposed plans for improvement should be submitted to the Board of Trade for their approval so as to « prevent wild and visionary schemes being tried at the great danger of injury or loss of life to the public ». His original letter of 31st March, 1841 addressed to The Rt. Hon. H. LABOUCHERE, President of the Board of Trade, was found in the Ministry of Transport archives a few years ago, and a copy of the last of the four sheets on which it was written, together with a complete typescript of the letter, is given in APPENDIX I.

On the other hand, I. K. BRUNEL, the brilliant engineer of the Great Western Railway, opposed any form of Government control and went so far as to say that he preferred enginemen who could neither read nor write as he did not consider they obtained the slightest knowledge of instructions from reading them !

Neither of the Acts of 1840 nor 1842 authorised accident inquiries by the Inspecting Officers though these were held from the earliest days. The Board of Trade had no powers to enforce the Inspecting Officers recommendations but in the majority of cases they were accepted by the railway who, in general, were anxious to improve the safety arrangements on their systems, though economic considerations were taken into account.

In the early days the speed of trains was not particularly high, but in spite of the rather primitive arrangements, travel by the new means of transport was relatively safe. A large number of persons were, however, injured through such causes as slipping when getting in and out of trains owing to the want of proper

footboards, and falling out of 3rd-class carriages, some of which were little more than open trucks.

Lieut. Colonel Sir FREDERICK SMITH, the first Chief Inspecting Officer, severely criticised the design of these carriages in his report on a derailment in Sonning Cutting, Great Western Railway, on 24th December, 1841. On this occasion eight passengers were killed and 17 were injured when a mixed train of two 3rd-class carriages and 17 wagons was derailed at night due to a bad slip in the cutting. Sir FREDERICK pointed out that not only were the 3rd-class passengers liable to be thrown out of their carriages but in winter they were exposed to all the rigours of the climate on journeys which lasted as long as 12 hours. This and similar criticisms in other reports added to the force of public opinion, so that a clause was inserted in the Railway Regulation Act of 1844 whereby each railway company was obliged to run one train per day in each direction for the poorer class of traveller, in carriages provided with seats and properly protected from the weather, and designed to the satisfaction of the Board of Trade; these trains became known as « Parliamentary trains », and they continued in use until 1883.

Unpunctuality was a great and constant source of dissatisfaction and also of danger, since trains were still run on the time-interval system. Captain MELHUISH, in his first inspection report in October 1840, found out that this was largely due to the clocks in different towns varying in time by as much as 10 to 15 minutes, and his suggestion was adopted that London time should be universal on railways; this became known as Railway Time.

Parliament appointed Select Committees in 1852 and 1857 to consider the causes of accidents on railways, and a Royal Commission, set up in 1865, also dealt with this subject. None of these bodies felt it was necessary or desirable to recommend material alteration in the law and they all agreed that responsibility for safe operation should rest on the companies concerned. The Royal Commission put matters in the right perspective when they pointed out that only 23 travellers out of 252 million had met their dealth in 1865 by causes beyond their own control, and added « We believe that no other mode of locomotion ever used by man can show a more satisfactory result, and we are therefore not prepared to suggest any alteration of the present law in this respect ».

In 1870 another Select Committee was appointed. It endorsed the views of its predecessors but added recommendations which led in due course to the Act of 1871, by which the powers of the Board of Trade were enlarged and made more precise so that comprehensive orders could be issued to the railway companies specifying the types of reportable accident; at the same time it legalised the holding of accident inquiries by Inspecting Officers, and authorised the setting up of more formal courts should these be deemed desirable by the President of the Board of Trade, who was compelled to make public the reports of these courts of inquiry and those of the Inspecting Officers. The powers of inspection were also extended to cover any additional work on a line that had already been

opened for traffic. It is a remarkable fact that this Act, which was the most important step so far taken in the cause of safety on railways, was passed through both Houses of Parliament virtually without debate.

Serious accidents which occurred from time to time continued to stir public opinion, and in 1874 another Royal Commission was appointed to go into the whole question of railway safety. It examined this subject most thoroughly and called no less than 336 witnesses who were asked some 43 443 questions. The witnesses included the Permanent Secretary to the Board of Trade, the four Inspecting Officers, and the principal officers of the railways as well as representatives of every grade of the rank and file. The Commission visited a number of railway centres and sponsored the continuous brake trials which were held at Newark in 1875. It also endorsed the doctrine which has been such a marked feature of railway legislation in Great Britain, namely that once a railway has been opened the management is responsible for working and maintaining it in a manner compatible with public safety. The following extracts from this Commission's report are noteworthy :—

« Upon full consideration, we are not prepared to recommend any legislation authorising such interference with railways as would impair in any way the responsibility of the companies for injury or loss of life caused by accident on their lines. To impose upon any public department the duty, and to entrust it with the necessary powers, to exercise a general control over the practical administration of railways, would not, in our opinion, be either prudent or desirable. A Government authority placed in such a position would be exposed to the danger either of appearing indirectly to guarantee works, appliances, and arrangements which might practically prove faulty or insufficient, or else of interfering with railway management to an extent which would soon alienate from it public sympathy and confidence, and thus destroy its moral influence, and with it its capacity for usefulness...

« Once a railway is opened, the State now holds the company responsible to maintain it, and work the traffic in a manner compatible with the public safety. The Government Inspecting Officers have powers of inspection, and their reports are exceedingly valuable; but to go further and clothe a Government department with unlimited powers to interfere in the interests of public safety with the detailed working of traffic upon railways, must necessarily create a concurrent responsibility, and in whatever measure this responsibility be cast upon a Government board, the responsibility now resting upon the railway companies will be diminished... We desire then at the outset to express our concurrence with the judgment formed upon this point by the Royal Commissioners of 1865 and to record our decided opinion that any change, which would relieve the railway companies from the responsibility which now rests upon them to provide for the safety of their traffic, would be undesirable. »

The Commission did, however, make a number of recommendations, chief of which were that the Absolute Block System should be enforced, interlocking

of points and signals should be made compulsory, and that the Board of Trade, should be given power to restrict the speed of trains on those lines where through lack of maintenance the permanent way had become dangerous. No legislative action of any significance resulted from these lengthy deliberations, which went on until 1877.

The collapse of the Tay Bridge as a train was passing over it on the night of 28th December, 1879 led to the appointment of one of the few formal courts of inquiry to investigate the disaster. A strong gale was blowing across the bridge and the ill-fated train had reached the centre when the middle section, over 1 000 yards in length, toppled over, and girders, piers and train fell into the river below. There were 75 passengers and train crew on board, all of whom perished. The bridge had only been opened to traffic six months previously and this raised criticism to the effect that its design and construction should have been supervised by the Inspecting Officers. In a minute approved by Joseph CHAMBERLAIN, who was President of the Board of Trade, it was stated :—

« It may appear to some that the present state of things is one which cannot be logically defended and that the Board of Trade ought to be entrusted with further powers. The experience of a great number of years has, however, shown that the present system does not work unsatisfactorily, and a little consideration will show that the public safety and convenience would not be promoted by such a change.

« In the first place, if the Board of Trade were to be held responsible for the designs of railway structures and for the supervision of their execution, they must employ a staff as experienced, as numerous and probably as highly remunerated, as the civil engineers by and under whom the structures are now designed and executed. If any public department were entrusted with the power and the duty of correcting and guaranteeing the design of those engineers who are responsible for railway structures, the result would be to check and control the enterprise which has done so much for this country, and to substitute for the real responsibility which rests on the railway engineer the unreal and delusive responsibility of a public office. »

In 1889, another important Regulation of Railways Act was passed as a direct result of the Armagh disaster on 12th June, when a heavily laden excursion train of 15 vehicles, fitted throughout with the non-automatic brake, failed to reach the top of a severe gradient. The train was divided to enable it to proceed in two portions but the rear 10 vehicles were inadequately secured and ran back 1 1/2 miles towards Armagh. The runaway vehicles crashed at great speed into a slowly moving passenger train which had left Armagh 20 minutes after the excursion in accordance with the time-interval system of operation. As a result, 78 passengers were killed and 260 more or less seriously injured. The new Act at last gave the Board of Trade power to order the adoption of the Absolute Block System, the provision of interlocking, and the equipping of trains with continuous automatic brakes. Most railway com-

panies had by this time installed these three great safeguards extensively and, with the passing of this Act, they were established on a statutory basis as fundamental principles of railway working.

Towards the end of the last century the question of safety of railway employees began to attract more and more attention in Parliament. A Select Committee was appointed in 1891 to enquire into the excessive hours of duty of railwaymen and as a result of their recommendations the Railway Regulation Act of 1893 gave the Board of Trade powers to hear complaints and if necessary to require the companies to arrange their schedules so as to keep the actual hours of work within reasonable limits. Many investigations were made by the Board, which did much to improve working conditions and thus reduce casualties from fatigue.

In 1900 the Railway Employment (Prevention of Accidents) Act further enlarged the powers of the Board of Trade, with special reference to railway servants, and it sanctioned the employment of assistant inspecting officers, now known as Railway Employment Inspectors, to enquire into the more serious accidents to employees. The Act also enabled the Board to require the use of any plant or appliance which they considered might increase the safety of employees, or the disuse of any plant which had proved to be dangerous.

Another section gave the Board power to make rules regarding dangerous railway operation, and in 1902 the « Prevention of Accidents Rules » were brought into use. These covered many diverse practices which are now accepted as common-place but in those days were by no means universally adopted. The placing of labels on both sides of a wagon was made compulsory, and the movement of vehicles by means of a pole known as « propping » was prohibited. Point rods and signals had to be covered in those places where they might be a source of danger, and ground levers so placed that men working them would be clear of the line. All engines had to be fitted with power brakes in addition to hand brakes unless they were used exclusively as shunting engines, and water gauges were made compulsory. Finally, the companies were required to appoint look-out men to give warning to men working on or near the railway for the purpose of re-laying or repairing the permanent way in all cases where danger was likely to arise.

The Ministry of Transport was formed in August 1919 and the Railway Department of the Board of Trade was transferred to it by Order of the Council in September of that year. Jurisdiction over Ireland ceased in 1921, and the Road & Rail Traffic Act of 1933 brought railway legislation up to date.

Finally, the Act of 1947 nationalised the British Railways and placed them under the control of the British Transport Commission, which was charged with the responsibility for the provision of an efficient, adequate, economical and properly integrated system of public inland transport with due regard to safety of operation. As already stated, the duties and the responsibilities of the Railway Inspectorate were in no way altered by nationalisation, and the relations between the Inspectorate and the British

Transport Commission, the Railway Executive and the Railway Regional Officers, are virtually the same as they were with the management and officers of the former main line railway companies.

Railway inspection.

On 28th October, 1840 Captain Melhuish, Royal Engineers, made the first official inspection of a new railway line on behalf of the Board of Trade in accordance with the terms laid down in the Regulation of Railway Act passed earlier in the year. In company with the officers of the railway he examined the 6 1/2 miles extension of the Birmingham-Gloucester Railway from Cheltenham to Gloucester. An indication of the spirit in which these investigations were made can be judged from the opening paragraph of Captain Melhuish's report. After referring to his instructions he added the following lines couched in the flowery language of those times :—

« Impressed with the spirit of those instructions not to throw a damp upon an enterprise, which involves interest of such magnitude, without a sufficient cause, and at the same time with the importance of them, after the numerous appalling accidents that have lately occurred, not to allow anything to pass unnoticed which, in my clear and decided judgment, ought to be considered dangerous and improper; I have the honour to report to your Lordships as follows :— »

The work was found to be generally in good order and the line was officially opened on the 30th October, but the next report on this railway was not so favourable. It was made by Lieut. Colonel Sir Frederick Smith following his inspection of a further eight miles extension from Birmingham to Cofton in December of the same year. He pointed out that some of the cuttings were unfinished and the embankments had not fully settled and on his recommendation the Secretary to the Board of Trade requested the Railway Company to postpone the opening of the line. The Directors declined to do this, and since the 1840 Act did not give the Board of Trade power to enforce their views they could but repeat their objections. The railway was duly opened and no further correspondence took place, though undoubtedly as a result of this and similar difficulties the Board's powers were increased in the 1842 Act.

From this time onwards the Inspecting Officers examined every new line of railway, and the opening dates of a number of projects were postponed until deficiencies had been made good. It does not appear that any special requirements were laid down in these early days, but the Inspecting Officers studied the practices adopted by the numerous companies who were building railways throughout the country and did much to foster the highest standards of the day in design and workmanship so as to ensure that the lines when first opened would be in a thoroughly safe condition. For example, in 1850 protracted discussions took place between the Inspecting Officers and the Engineer of the Manchester, Sheffield and Lincolnshire Railway regarding the strength of the Torksey Bridge over the river Trent, and its opening was post-

poned until the Inspecting Officers were satisfied about its safety. At that time there was no specification for railway bridges but the Inspecting Officers followed the recommendations of the Girder Commissioners' Report and used the experience which they had gained from inspections of earlier bridges, including those over the Menai Straits and the river Conway.

After carrying on in this way for a number of years it was decided to circularise the railway companies and advise them of the main safety measures which the Inspecting Officers would require before authorising the opening of new lines of railway. These became known as the Board of Trade (later Ministry of Transport) Requirements.

Requirements.

The first known edition was issued on the 29th April, 1858 and a copy is given in APPENDIX II. It consisted of only 1 1/2 pages and dealt primarily with station layout, signalling and level crossings; no reference was made to bridging. It will also be noted that the companies had to give an undertaking that single lines would be worked under the « one engine in steam » system.

With the publication of the third edition in 1860, the methods of working single lines were extended so as to cover the train staff and ticket system and pilotman working. This edition also gave for the first time a list of the documents to be submitted to the Inspecting Officers before the date of opening. These included copies of the Parliamentary plans and sections, tables of gradients, curves, cuttings and embankments, bridges and tunnels, in addition to a description of the permanent way and drawings of all bridges and viaducts. This list of documents has remained virtually unaltered ever since.

In the 1862 edition a further section was added giving recommendations about precautions to be taken in the working of railways. Amongst other items, a means of communication between driver, guard and passengers was required, and particulars were given of the brake power which should be provided on passenger trains. In the 1877 edition special stress was laid on the installation of continuous automatic brakes on all passenger trains but it was not until 1889 that this was made compulsory, as a result of the Armagh disaster.

Bridges were first mentioned in 1860, when it was specified that the maximum permissible stress in wrought iron should not exceed 5 tons per sq. inch and « for every cast-iron bridge the breaking weight should be equal to three times the permanent load due to the weight of the superstructure, added to six times the greatest moving load that can be brought upon it ». The first reference to steel was made in 1877, when a maximum working stress of 6 1/2 tons per sq. inch was permitted, though the engineer was required to submit a certificate to the effect that the steel employed was « either cast steel or steel made by some process of fusion subsequently rolled or hammered and of a quality possessing considerable toughness and ductility ».

In the June 1881 edition, as a result of the Tay Bridge disaster 18 months previously, special reference was made

to wind pressure, and the use of small cast iron columns in high bridges was prohibited. Four years later cast iron was not allowed in bridges except in the form of arch-ribbed girders when the material was in compression. These clauses were included in all editions up to 1914, after which there was a gap in publication until 1925 when a completely revised set of requirements was issued. By this time British Standards Specifications were in general use and Specification No. 153 for girder bridges, which was first published in 1922, was recommended for adoption with a standard loading of 18 units.

Very little has been laid down about the permanent way, and no restrictions have been placed on the type of construction which should be used. Chaired track with bull-headed rails has been the standard until recently, when the Railway Executive decided to change to the flat bottomed rail. This has been noted in the latest edition of requirements, which specify a minimum weight of 98 lbs per yard for this type of rail in lines carrying heavy traffic at high speed (the present standard weight is 109 lbs per yard).

The requirements for signalling were expanded throughout the years as practice developed. The grouping of signal and switch levers in a frame was first recommended in 1860, when the elementary interlocking rules were given. These specified that the levers « should be so arranged that the signalman shall be unable to lower a signal for the approach of a train until he has set the points in the proper direction for it to pass; and that it shall not be possible for him to exhibit at the same moment any two signals that can lead to a collision between two trains ». Two years later a further paragraph was added that the locking should be such « that after having lowered his signals to allow a train to pass he (the signalman) shall not be able so to turn his points in the wrong direction as to cause a collision between any two trains ».

The interlocking of distant signals with the home and starting signals was not enforced until 1892. This year also saw the standardisation of signal lamp colours with green for « All Right » and red for « Danger ». Yellow for « Caution » was added in 1925 when colour-light signals were first mentioned. These had been in use for a number of years, during which time big advances had been made in signalling practice with the development of power operated points and track circuiting in conjunction with colour-light signalling.

The installation of track circuits in this country was accelerated following an accident on 24th December, 1910 near Hawes Junction on the Midland Railway main line to Scotland, when the late night express from London to Glasgow overtook at high speed two light engines which were slowly travelling in the same direction. The two leading coaches of the express were telescoped and caught fire, which eventually destroyed the whole train. The collision was due to the signalman accepting the express before despatching the light engines, which he had forgotten. They were standing out of sight of the signal box on the Down Main between the Starting and Advanced Starting signals;

the provision of a track circuit would have prevented the signalman lowering the Home signal even if he had erroneously accepted the express.

The latest edition of Requirements was issued in 1950. It was compiled by the Inspecting Officers after consultation with senior railway officers, as had been done in the past, and it is a 30-page booklet setting out briefly the chief requirements needed to comply with sound railway construction and signalling practice. The first section gives the documents which are to be sent to the Ministry of Transport when works are submitted for approval and, as already mentioned, these are almost identical with those specified nearly 100 years ago. The next section requires conformity with the Absolute Block System of operation, namely the maintenance of an adequate space interval between trains by means of three-position block instruments or other approved method, such as automatic signalling with continuous track circuiting.

The principles governing safe signalling practice are set out in general terms. The position, type and aspect of signals, both semaphore and colour-light are specified, and the main rules for interlocking are given; these are very similar to those laid down in 1860. The latest methods of co-ordinating the working of signals and block instruments have been included for the first time and they are based on lessons learnt from accidents during the last 50 years. Amongst the methods recommended are the release of the starting signal, for one operation only, by acceptance of the train from the box in advance; the prevention of such acceptance unless the first stop signal at this box is at Danger and the distant signal at Caution; the interlocking of successive stop signals worked by the same box so as to ensure that none can be cleared unless the next ahead is at Danger; and the provision of a Home berth track circuit, which when occupied exhibits and maintains the « Train on Line » indication on the block instrument of the box in rear.

Finally there is the control which prevents the acceptance of a train unless the previous train has passed through the block section and has occupied and cleared the track circuit at the forward end. This is known as the « Welwyn Control » as it was introduced after a serious collision at Welwyn Garden City on 15th June, 1935. This station was equipped with all the other safeguards described above but in spite of this a signalman was able to accept a second train before the first had cleared his station. For some unexplained reason he overlooked a train which was slowly approaching the Home signal, and he gave « Train out of Section » before it had reached the berth track circuit. He was thus able to accept a second express which overtook the first while it was still travelling slowly through the station.

The safety requirements at stations include restrictions on minimum widths, heights and clearances of platforms, the provision of footbridges at important stations and the construction of stairways and ramps. It is recommended that bridges and viaducts should, whenever practicable, be wholly constructed of masonry, brickwork or concrete and that the design and construction of steel gir-

der bridges should be governed by British Standard Specification No. 153. A brief reference is made to permanent way, and a further section gives the standard dimensions and clearances. The safety precautions to be taken at level crossings are set out in detail and these include the provision of gates swinging alternately across road and rail at all public level crossings, though lifting barriers have recently been sanctioned; stop as well as distant signals interlocked with the gates are required at all important crossings.

Another section deals with electric railways and gives particulars of the precautions to be taken against risk of fire or electric shock on both tube and surface lines. Reference is made to the Railway (Standardisation of Electrification) Order of 1932 which lays down the type and voltage of the power supply, as well as the clearances to be observed in the electrical equipment.

The actual inspection routine has been changed little during the past century. In the first place, it should be remembered that approval and sanction is limited to railways carrying passenger traffic; hence goods lines, goods loops and marshalling yards may be built without reference to the Ministry of Transport, so long as passenger working is not affected in any way. Secondly, the « physical » works do not include signalling installations where no alterations have been made to the permanent way. With the development of modern signalling during the present century an informal agreement was reached with the railway companies in 1935 that all novel forms of signalling or major signalling installations should be submitted for approval irrespective of any permanent way alterations. This arrangement has worked very smoothly and is a further illustration of the principles underlying railway inspection in this country, in which reliance is placed much more on willing co-operation than on statutory coercion. Thirdly, the Requirements are not embodied in any legal document and they can be relaxed or altered, with due regard to safety, at the discretion of the Inspecting Officer.

The normal procedure before a new work is commenced is to submit the plans to the Minister of Transport for approval. These are examined by the Inspecting Officers, and in the case of major works, meetings are usually arranged with the railway officers concerned in order to settle any difficulties and to decide on any alterations. The Minister's provisional approval of the work is then given subject to final inspection on completion. This inspection is carried out as soon as practicable after the work is finished and, whenever possible, before it is brought into use. The Inspecting Officer concerned submits a report to the Minister of Transport giving a short description of the work and setting out any modifications which he may consider desirable. Finally, the Minister's formal approval is given, subject where necessary, to compliance with the Inspecting Officer's recommendation.

The State has never exercised jurisdiction over the design of locomotives and rolling stock except « Parliamentary train » carriages and electric tube railway stock; a special clause instructing managements to submit drawings of this

type of rolling stock has been inserted in each of the Acts authorising the construction of Tube railways, primarily with the object of ensuring that adequate precautions are taken against the risk of fire and electric shock.

A number of modifications in design have, however, been introduced as a result of the lessons learnt from accidents in the past; for example the substitution of electricity for gas was recommended by Colonel PRINGLE in his report on the Hawes Junction collision in 1910, and this recommendation was further reinforced by the disaster near Gretna in 1915.

Some tank engines of a class with 2-6-4 wheel arrangement were redesigned and converted to tender engines as a result of the accident at Sevenoaks on 24th August, 1927 when a passenger train travelling at high speed was derailed owing to the excessive rolling of one of these engines on track which was not in first class condition. The side control of some large 2-6-2 type tender engines was likewise redesigned following the derailments at Hatfield and Marshmoor in 1946.

Accident investigations.

The types of accident to be reported to the Minister of Transport can be briefly summarised as follows :—

(*a*) All accidents to passenger trains.

(*b*) All accidents to goods trains on or affecting passenger running lines.

(*c*) All cases of trains becoming divided and all breakages or other failures of couplings on passenger running lines.

(*d*) Mechanical failures which have caused or may cause an accident to a passenger train.

(*e*) All rail breakages on passenger running lines.

(*f*) Accidents to any persons working, travelling, having business, or trespassing on the railway, except that accidents to railway servants need not be reported if they have been absent from duty for 3 days or less.

The train accident reports are examined by an Inspecting Officer, and accidents to the staff by a Railway Employment Inspector; where necessary, questions are raised and fuller information is obtained from the railway management concerned. Sometimes the railway officers are asked to discuss with the Inspecting Officers any special points on which they need more detailed information or require action to be taken. Ministerial inquiries are hield into the more serious train accidents, usually whenever there are passenger fatalities but also in other cases where, for example, the cause is obscure or other circumstances warrant a detailed investigation and a published report. The decision, however, rests entirely with the Chief Inspecting Officer and depends a great deal on the facts which have been disclosed in the railway management's report.

As already mentioned, two types of inquiry were authorised by the 1871 Act, namely :—

(*a*) *A formal investigation*, in which a legal officer is appointed to hold the inquiry, with an Inspecting Officer to assist him. Such an investigation is held

in open court and witnesses are examined on oath.

(*b*) *An Inspecting Officer's inquiry,* in which an Inspecting Officer is appointed by the Minister to carry out the investigation. This is not a court of law and evidence is not taken on oath, nor is the Inspecting Officer bound by the strict rules of evidence.

The formal investigation has seldom been ordered and the last one was held into the Tay Bridge disaster in 1879. The normal type of inquiry is undertaken by an Inspecting Officer who usually opens the proceedings and hears the evidence in the presence of the press and members of the public. He may, however, at his discretion, exclude them, though this is not usually done unless the officer considers a witness might be prejudiced regarding future possible criminal proceedings if he gave his evidence in public.

The Inspecting Officer is not concerned with criminal negligence, nor with civil liability, and his sole object is to ascertain the technical cause of the accident, and to make recommendations with a view to preventing its recurrence. His inquiry is quite independent of the railway management's private inquiry but the evidence taken at this investigation is always placed at his disposal. Railway officers and representatives of the Trade Unions attend to assist the Inspecting Officer but his findings are his own independent responsibility.

He hears the evidence and cross-examines the witnesses, after which he invites the railway officers and Trade Union representatives to put questions. A solicitor attending the inquiry has no special status as such but he would be permitted to put a question to a witness through the Inspecting Officer if it were strictly relevant for the purpose of the inquiry. On completion of the examination of witnesses the public proceedings are closed, but frequently protracted investigations have still to be undertaken before a final conclusion is reached. In due course the report is published, and it is invariably sent to the railway management for their observations on the Inspecting Officer's recommendations. These still cannot be enforced by law but the effect of publicity, combined with a thorough investigation and discussion with the railway officers, usually results in the recommendations being accepted.

The form of train accident reports has not materially altered since 1840, though the evidence is now summarised instead of being given in full, as was the practice at one time; in complicated cases, however, extracts are still reported verbatim. The report opens with a statement of all relevant facts; the description follows and sets out full geographical and physical details, often with the addition of drawings. Other sections deal with the circumstances and the effects of the accident, description and condition of the stock, reference to rules and regulations, notes on any trials or experiments which have been made, and the relevant evidence. Finally the causes, fundamental and incidental, are fully considered in the Conclusion and individuals are criticised when necessary. The report ends with Remarks and Recommendations as may be appropriate.

The Railway Employment Inspectors also hold inquiries into personnel accidents. These are conducted on somewhat similar lines to the Inspecting Officers' inquiries, except that press and public are not usually present and as a rule the reports not published. They are, however, sent to the Railway management and to the Trade Unions and a reference is made to the more important cases in the Chief Inspecting Officer's Annual Report.

This Report is published each year and it contains comprehensive statistics of accidents which have occurred during the past 12 months, together with comparisons with previous years. Précis of all the train accident inquiries are given, and a summary of other noteworthy train, level crossing, movement and personnel accidents is included. Finally, the year as a whole is reviewed, and the Chief Inspecting Officer usually expresses his opinion regarding the main features which have affected the year's working from the point of view of safety.

This accident procedure has been gradually evolved but it differs little in principle from the original arrangements which were made over 100 years ago. Many of the safety rules and appliances which have been developed during this period are the result of suggestions put forward by Inspecting Officers and railway officials at these investigations.

Reference has been made to this in the preceding sections and hence there is no need to give further examples, though it is interesting to note that the first Inquiry was held by Sir Frederick Smith shortly after his appointment. He investigated the cause of a derailment of a mixed train on the Hull & Selby Railway on 7th August, 1840, when seven passenger carriages were derailed by an iron casting which had fallen off an open goods wagon next to the engine.

The most serious railway accident in Great Britain occurred on the 22nd May, 1915 at Quintinshill near Gretna, on the Scottish border, when a heavily loaded troop train collided at high speed with a stationary local train; the resulting wreckage was hit by an express, also travelling at high speed but from the opposite direction. The gas cylinders in the troop train caught fire, with disastrous results. Altogether 227 persons were killed and 246 were injured. This was another case of a signalman overlooking a train at his station. The report on this accident, which occurred during the first Great War, was not published at the time for security reasons.

The nearest counterpart to this disaster occurred at Harrow on 8th October, 1952, when 112 persons were killed. An express from Scotland ran into a stationary local train, crowded with passengers, and the wreckage was struck by a London to Manchester express. The report on this accident has not yet been published.

Conclusion.

It will be seen from this paper that the great feature of British legislation on railway safety has been its attempt to secure effective results with the least possible interference in technical matters, and in this it has been remarkably successful. In Great Britain the passenger has long enjoyed a high degree of safety

in railway travel, whilst a wide field has been left to individual resource and ingenuity in perfecting many types of signalling and other safety devices, and in testing their relative merits in service on an extended scale. At the same time the relations between the Inspecting Officers and the railway officials of all grades have been good, and certainly in later years marked by great mutual confidence. The publicity given to official accident inquiries and reports has had a beneficial effect on the course of events, and the policy adopted has been in keeping with the well known British principles of allowing the individual the maximum freedom to develop ideas and projects on his own initiative, and of restricting Government regulation to the minimum essentials.

APPENDIX I

Copy of Letter from George Stephenson.

To the

Right Honble H. Labouchere,

President of the Board of Trade.

Sir,

Since my examination before the select committee on Railways I see the difficulties you have to contend with, from the opposing members to your Bill in bringing forward a measure for the management and better regulation of Railways. I am quite sure that some interference on the part of Government is much wanted. Perhaps I ought to be the last man to admit this (the whole system of Railways, and Locomotive Engines having been brought out by my exertions) but when I see so many young Engineers, and such a variety of notions, I am convinced that some system should be laid down, to prevent wild, and visionary schemes, being tried, at the great danger of injury or loss of life to the public. I consider it right that every talented man should be at liberty to make improvements, but that the supposed improvements should be duly considered by proper judges. Then the question follows, from the opponents to the Bill, who are those judges to be? I beg to lay before you my views on this point.

Suppose any Engineer has any improved plan for the better working of Railways to propose, he should submit his plan to the Engineer belonging to the Board of Trade, but before that Engineer should give his decision as to the utility of the scheme, he should have full power to call together the chief Engineers of the principal Railways of the Kingdom, and after the subject has been duly discussed, votes should be taken for and against the measure: the discussion should be laid before the Board of Trade, accompanied with the observations of the government Engineer, and if approved of should be then placed into his hands to carry out.

I should propose for the consideration of the different Engineers that the speed of Locomotives should not exceed forty miles per hour on the most favourable Lines, excepting on special occasions: curved Lines to diminish in velocity according to the radius. I am quite aware that this cannot be carried out to any great nicety, but still it would be a check upon the Drivers. Collateral Lines require government consideration is a very strong point of view.

Uniformity of signals is another desirable point.

As several persons are now turning their attention to the construction of self acting breaks, it will soon appear that great benefit and safety to travelling will be found by their adoption. In the mean time no train should be allowed to travel which has not two breaksmen, and four coaches in each train should be provided with breaks to allow for contingencies. It is my opinion that no contrivance can be found out by which the breaks can be dispensed with.

Six wheeled Engines and carriages are much safer and more comfortable to the travellers than four; any person riding one hundred yards upon an engine or coach constructed upon this plan would discover the difference. The rim of all Railway wheels ought to be made the same width, and the axle trees for all coaches of a strength approved of by the Engineers, both wheels, springs, and axles should bear the government stamp, to being made of the best materials, as every practicable means ought to be made use of in order to have these made of the best iron.

All disputes between Railway Companies should be decided by the Board of Trade.

It appears to me that the above suggestions might be carried out with success, without interfering injuriously with Railway property. I hope that you will not consider that I am intruding by sending you these observations.

I am, Sir,

Your Most Obt. Servant,

(Sgd.) Geo. Stephenson.

Tapton House,

nr. Chesterfield.

March 31st, 1841.

APPENDIX I

Facsimile of the last page of George Stephenson's letter.

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to carry out.

APPENDIX II

The first Requirements of the Inspecting Officers of Railways.

Railway Department,
Board of Trade,
Whitehall, S.W.
29th April, 1858

Sir,

Several cases have recently occurred in which the opening of New lines of Railway has been postponed because certain of the requirements of the Inspecting Officer had not been completed.

In order to prevent as far as possible the disappointment which such postponement must occasion to the Companies, The Lords of the Committee of Privy Council for Trade have considered it desirable to forward the accompanying statement which sets forth some of these requirements, a deficiency in which has generally caused the opening of new lines of Railway to be postponed.

I am, Sir,
Your obedient Servant,
(Sgd.) Douglas Galton.

The Secretaries to
79
Railway Companies.

Memorandum of some of the Requirements of the Inspecting Officers.

AT THE STATIONS.

Platforms to be not less than 6 feet wide, and when raised, the descent at the ends should be by means of ramps, and not by steps.

Clocks to be provided in a position where they are visible from the line.

Signals and distant signals in each direction to be erected.

The lever handles of switches and signals to be placed in the most convenient position, and to be brought as close together as possible, so as to be under the hand of the person working them. The switches to be provided with double connecting rods.

No Facing Points, except on single lines or at double junctions. In the case of Facing Points at junctions, it is most desirable that the signals should be connected with the points so as to be worked in conjunction with them, and to indicate whether they are open or shut.

Sidings, if falling towards the line, or on a level, to be provided with locked chock blocks, or locked points, leading into a blind siding.

Turntables for engines to be erected at terminal stations.

AS REGARDS THE LINE GENERALLY.

No standing work above the level of the carriage steps to be nearer to the rail than 3 feet 6 inches, where the carriages are not above 7 feet 4 inches in width, outside measurement.

The interval between adjacent lines of rails, and between lines of rails and sidings, must not be less than 6 feet.

When stations occur on, or immediately contiguous to, a viaduct, a parapet wall on each side, 3 feet high, should be built, with a hand railing or a fence on the top sufficient to prevent passengers from falling over the viaduct in the dark.

At all level crossings of turnpike roads or of important public roads, the gates must be so constructed as to be capable of closing across the Railway as well as across the road.

A fixed signal, either attached to the gate or otherwise, to be placed at every level crossing, and when the level crossing is so situated that an approaching train cannot be seen for a sufficient distance, distant signals will be required.

Main signals and distant signals for each line are required, at all junctions.

Where the lines are single, an undertaking will be required, to be signed by the Chairman and Secretary of the Company, that the line shall be worked in such a manner that only one engine in steam, or two or more when coupled together and forming part of a train, shall ever be upon the single line, or upon defined portions thereof at one and the same time.

[656 .211 .7 (42)]

Cross-channel services of British Railways,

by A. L. Pepper,

(Assistant, Marine Dept., The Railway Executive, British Railways).

The cross-channel services of British Railways are an integral part of the transport system of this country, being essential links in the chain of communications between Great Britain and other countries. To an island so traditionally dependent on shipping for it's livelihood, these services are of considerable importance, as the following figures will indicate.

In the year 1951, the ships of British Railways' cross-channel services to the Continent and the Channel Islands conveyed 2 345 000 passengers and 115 000 motor-cars — an all-time record for these routes; while on the West coast, the vessels of the Irish services carried 1 442 000 passengers. On the freight side, upwards of 1 700 000 tons of cargo were carried by all services in the year as well as 163 000 head of livestock. It is interesting to note that, in carrying the passenger and freight traffic, British Railways' ships steam in total about 2 million miles each year, a figure which, considering the relatively short crossings is an illuminating commentary on the intensity of the services operated throughout the year.

Services.

The shipping services operated by British Railways vary considerably in character, radiating from ports on the East, South and West coasts of England. The table hereafter sets out détails of the cross-channel services.

It will be observed that the general tendency is for the shorter passages to be performed by day and the longer by night, although there are exceptions to this in that the Southampton/Weymouth-Channel Islands, Newhaven-Dieppe and Holyhead-Dun Laoghaire services are both day and night in the summer season. With night crossings such as the Harwich-Hook of Holland and Southampton-Havre services, the first requirement of the passenger is a comfortable sleeping berth where he can have a night's rest, and the aim is, therefore, to provide as many of these berths as possible, preferably in cabins. Desirable as this feature may be, there are some services where it is quite impracticable to provide sufficient sleeping accommodation during the busy summer season. On the Holyhead-Dun Laoghaire mail service, for example, over 2 000 passengers are carried on one sailing in July and August, and only about one-fifth of these can be provided with sleeping berths. As this is both a day and night service during the summer, the problems of ship design are not easy of solution, as spacious public rooms with ample seating accommodation are equally necessary when the vessel is on the daylight schedule. A similar pro-

ROUTE	Crossing time		Type of service
	Hours	Minutes	
Dover-Calais « Golden Arrow »	1	20	Day
Dover-Boulogne	1	45	Day
Dover-Dunkerque (Train Ferry)	4	0	Day & Night
Folkestone-Calais	1	30	Day
Folkestone-Boulogne	1	30	Day
Newhaven-Dieppe	3	30	Day & Night
Southampton-Havre	7	0	Night
Southampton-Saint-Malo	9	0	Night
Southampton-Guernsey	6	45	Day & Night
Southampton-Jersey	7	30	Day & Night
Weymouth-Guernsey	5	0	Day & Night
Weymouth-Jersey	6	45	Day & Night
Jersey-Saint-Malo	3	0	Day
Guernsey-Saint-Malo	5	0	Day
Heysham-Belfast	7	20	Night
Holyhead-Dun Laoghaire	3	15	Day & Night
Holyhead-Dublin	5	0	Night
Stranraer-Larne	2	15	Day
Fishguard-Rosslare	3	15	Night
Fishguard-Waterford	8	0	Night
Harwich-Hook of Holland	8	0	Night
Harwich-Antwerp	14	30	Night
Harwich-Rotterdam	12	0	Night
Harwich-Zeebrugge (Train Ferry)	8	0	Night
Hull/Goole-Rotterdam, Hamburg, Antwerp, Ghent, Bremen and Copenhagen	—	—	Day & Night

blem is encountered with the services from Southampton and Weymouth to the Channel Islands, where the density of the traffic is greatest on Fridays and Saturdays during the height of the summer season and accommodation on board is taxed to the limit. Here again, the vessels perform night and day crossings and a balance has to be struck between accommodation for sleeping and ample day rooms.

Typical of the day crossings by the shorter routes are the services linking the South Coast ports with France — Dover/Calais, Folkestone/Boulogne and Newhaven/Dieppe, where the crossing times vary between 1 hour 20 minutes to 3 1/2 hours. Dover, the « gateway to the Continent », is probably known to more would-be travellers from this country to the Continent than any other cross-channel port, as it opens up such a vista of varied and delightful holiday countries as France, Switzerland, Austria and Italy to mention but a few. Here, the demand is for vessels with ample public rooms, restaurants, bars, etc., with plenty of seating accommodation. Upwards of 1 500 passengers at a time are carried on the ships operating these short-sea routes and with a crossing time of under 2 hours and the cliffs of Calais visible shortly after leaving Dover or Folkestone, it is easy to understand why

there is no demand for sleeping accommodation except perhaps from those unfortunate passengers to whom the sea crossing is the least enjoyable part of any holiday trip.

Two of the services which are specialised in nature are the Dover-Dunkerque and Harwich-Zeebrugge train ferry services. The former is for passengers and cargo and the latter for cargo only. Passengers can be conveyed in sleeping cars from London to Paris without being disturbed en route and cargo can be carried from a sending point on the Continent to London without any transhipment. The motor-car services between Dover-Boulogne and Stranraer-Larne are a comparatively new innovation and they perform the same service for wheeled road vehicles as the train-ferry performs for rail wagons.

The services with the Channel Islands provide an essential link between the mainland and these outlying isles for both passengers and cargo. The livelihood of the islanders depends on transport for the products of the land, particularly potatoes and tomatoes destined for the markets on the mainland, and also for carrying holidaymakers to the islands during the summer months. The routes to Ireland are equally important, the Heysham-Belfast and Stranraer-Larne services covering Northern Ireland and the Holyhead-Dun Laoghaire, Holyhead-Dublin, Fishguard-Rosslare and Fishguard-Waterford services running to Eire. Other services to Ireland are, of course, operated by private shipping companies, most of which are subsidiary companies of Coast Lines Limited.

The services with Holland, Belgium, Denmark and Germany from Harwich and the Humber have been in operation for a great number of years, and perhaps the best known of these routes is the Harwich-Hook of Holland service which is the gateway to the Northern European countries.

Ships.

The British Railways cross-channel fleet consists of 75 ships (apart from some 60 coastal-water craft), with an aggregate gross tonnage of some 154 000. They vary in size and type from such large passenger ships as the s.s. *Amsterdam* on the Harwich-Hook of Holland service (5 092 gross tons and the biggest of British Railways' vessels), the m.v. *Cambria* and m.v. *Hibernia* (4 972 tons) on the Holyhead-Dun Laoghaire service and the s.s. *Normannia* on the Southampton-Havre service, to comparatively small craft like the s.s. *Haslemere* (832 tons) Southampton-Channel Islands cargo service, and s.s. *Sheringham* (1 088 tons) Harwich-Rotterdam cargo service. Through this range of ships there are the specialised types of vessels such as the train ferries s.s. *Hampton Ferry* (Dover-Dunkerque ferry service) and m.v. *Norfolk Ferry* (Harwich-Zeebrugge ferry service), built specially for the conveyance of rail vehicles, and ships constructed for the transport of motor-cars such as the s.s. *Lord Warden* (Dover-Boulogne motor-car service), the most modern cross-channel motor-car carrier in this country. These craft, which incorporate some interesting constructional features, are dealt with in more detail below.

It is not possible in an article such as

this to go into the detail of all the vessels of British Railways' fleet, but the following table gives some brief information of representative ships :—

SHIP	Gross tons	Machinery	Horse-power	Speed-knots
PASSENGER :				
Amsterdam	5 092	Turbine	12 350	21 ½
Cambria	4 972	Motor	9 600	21
Duke of Argyll	3 799	Turbine	8 100	21
Normannia	3 543	Turbine	8 000	19 ½
Maid of Orleans	3 777	Turbine	11 000	22
Invicta	4 191	Turbine	11 000	22
Lord Warden	3 333	Turbine	8 000	19 ½
Saint Patrick	3 482	Turbine	8 500	20
Melrose Abbey	1 924	Triple Expansion	2 800	14 ½
Hampton Ferry	2 989	Turbine	4 900	16 ½
CARGO :				
Suffolk Ferry	3 134	Motor	3 000	14
Winchester	1 149	Motor	3 000	15
Sheringham	1 088	Reciprocating	2 300	14
Blyth	1 122	Reciprocating	1 950	13
Slieve Bloom	1 297	Turbine	2 800	16
Ringwood	755	Reciprocating	1 850	15
Autocarrier	985	Reciprocating	2 000	15

Each particular trade requires a particular type of ship. The majority of British Railways' larger cross-channel vessels are designed primarily for the conveyance of passengers, although cargo and mails are also carried. The sister ships m.v. *Cambria* and m.v. *Hibernia* on the Holyhead-Dun Laoghaire route are fast passenger vessels with a speed of 21 knots, scheduled to maintain the « Irish Mail » service on timings fixed by the Post Office. The 58 mile run port to port is accomplished in 3 1/4 hours. With a passenger certificate of over 2 000 and sleeping accommodation for 436, these two fine motor ships are a considerable advance in size, design and comfort compared with their predecessors of some 30 years ago.

Two other passenger ships of comparable size are the s.s. *Amsterdam* and s.s. *Arnhem*. These vessels also maintain a Royal Mail service between Harwich and the Hook of Holland. The emphasis here, however, is on sleeping accommodation, as the ships are engaged solely on a night run and their passenger certificate is only 675, with sleeping accommodation for upwards of 550. The distance port to port is 116 miles, with a crossing time of 8 hours.

On the short-sea routes from Dover and Folkestone, two of the most popular ships are the s.s. *Invicta* and s.s. *Maid of Orleans*. The former, well known on the « Golden Arrow » service, has a gross tonnage of 4 191 and a speed of 22 knots. With a passenger certificate

of 1 400 she is typical of the modern day cross-channel ship. She has a bow rudder, and a stabiliser has been fitted to her since she has been in service. The *Maid of Orleans* is one of the latest additions to the fleet engaged on the short-sea routes and she takes her turn on the « Golden Arrow » service. She is also fitted with bow rudder and stabiliser.

The cargo ships are designed primarily to meet the requirements of the particular trade. The six vessels maintaining the Holyhead-Dublin and Heysham-Belfast cargo services all have ample livestock accommodation varying from 385 head of cattle in the s.s. *Slieve Donard* to 735 head in the s.s. *Slieve Bearnagh*. All are fast ships with speeds varying from 16 to 17 knots.

Photograph : British Railways.

s.s. *Amsterdam* (Harwich-Hook of Holland service).

The s.s. *Normannia* (3 543 tons) was delivered last year and she maintains the Southampton-Havre service. This vessel replaced the 40 year old s.s. *Hantonia* (1 594 tons), whose turbines have been retained as an historical relic. A comparison of the two vessels would reveal interesting developments in ship design both from the engineering standpoint and passenger accommodation aspect.

The m.v. *Winchester* and s.s. *Ringwood* on the Southampton-Channel Islands cargo service are provided with spacious holds for the important potato and tomato traffic from the islands, as well as cattle accommodation.

The Associated Humber Lines fleet includes 12 cargo vessels all of which are just over 1 000 gross tons each, with speeds varying from 10 to 14 knots.

They carry large quantities of traffic between Hull/Goole and Continental ports in Northern Europe.

The conveyance of traffic in containers has long been an accepted method of transport and it follows, therefore, that British Railways cargo vessels must be equipped with the means of carrying these receptacles. The ordinary cargo holds are unsatisfactory for stowing containers and in view of the uneconomical nature of this method of transport it has been desirable to give consideration to the construction of vessels specially designed for containers. Until such vessels are made available, the carriage of containers by sea will continue to be undertaken at some financial loss. Such vessels as the s.s. *Sheringham* (Harwich-Rotterdam service) and the s.s. *Hythe* (Southampton-Channel Island) can only carry a few containers, some of which have to be stowed on deck.

The fleet of 75 vessels consists of 40 passenger and 35 cargo ships, and the following table will give some idea of the disposition of these craft.

Photograph : British Railways.
s.s. *Normannia* (Southampton-Havre service).

It will be understood that the strength of the fleets on the various services is not always the same as, to meet the needs of traffic, it is often necessary to transfer a vessel from one service to another.

War losses and new tonnage.

During the period 1939 to 1947 the railway companies' fleets were depleted by as many as 51 vessels, mainly as a

SERVICE	Number of vessels	
	Pass.	Cargo
Harwich-Holland/Belgium . .	3	5
Dover/Folkestone-France (a)	12	2
Newhaven-Dieppe (b) . . .	4	3
Southampton-Channel Isles/ France	6	5
Weymouth-Channel Isles . .	2	2
Fishguard-Eire (c)	4	—
Holyhead-Eire	3	4
Heysham-Belfast	3	2
Stranraer-Larne	1	—
Humber-Continent	2	12
	40	35

Notes :

(a) Dover/Folkestone fleet includes two vessels owned by French National Railways and one by French Company, Angleterre-Lorraine-Alsace.

(b) The Newhaven-Dieppe fleet is a jointly owned venture, French National Railways and British Railways.

(c) Three passenger ships operating to Rosslare owned by Fishguard and Rosslare Railways & Harbours Co.

result of enemy action, and these heavy losses have necessarily had a serious effect on the provision of post-war shipping facilities. In spite of this shortage of ships, which has been felt acutely during the peak of the summer season when every vessel is pressed into service, it has been possible to reinstate nearly all the pre-war services.

At the end of the war, the various railway companies embarked on programmes of new construction not only to make good some of the war losses but also to provide replacements of life-expired ships. With the advent of nationalisation, British Railways assumed the responsibility for the provision of new tonnage and undertook the formulation of a five-year shipbuilding programme of replacements of war losses and obsolete craft. Since the end of hostilities, despite the high cost of construction, 14 new vessels have been added to the cross-channel fleet and 2 are now building. Of those delivered, mention might be made of the *Maid of Orleans, Brighton, Normannia* and *Lord Warden* operating in the English Channel, the *Amsterdam* for the Harwich-Hook of Holland service, the *Norfolk Ferry* for Harwich-Zeebrugge and the sister ships *Cambria* and *Hibernia* on the Irish routes. The vessels at present under construction are two cargo ships for Associated Humber Lines.

The proposals in the shipbuilding programme for the next few years provide for further new tonnage, both passenger and cargo, and these projects will be undertaken in the light of developments and changing circumstances. It is clear, therefore, that British Railways are taking every step, within the limits of the present financial stringency, not only to make good many of their war losses but also to modernise their fleet to meet the needs of an expanding traffic and to combat the ever growing competition of air transport.

Train ferries.

Amongst the specialised types of vessels operated by British Railways, perhaps the most interesting from the point of view of design are the train ferries. Seven of these vessels are operated by British Railways, four between Dover and Dunkerque and three between Har-

wich and Zeebrugge. Train ferries originated in this country during the first World War, when a number of vessels were constructed for the transfer of rolling stock to the Continent. These vessels were later taken over to establish, in 1924, a service between Harwich and Zeebrugge, the first commercial train ferry service between England and the Continent. This is a cargo service only and it is interesting to note that one of the train ferries still operating on this route, the s.s. *Essex Ferry,* is the sole survivor of the three vessels that were used during the first World War. The other two were sunk by enemy action in the second World War and have been replaced by new tonnage — the m.v. *Suffolk Ferry* and m.v. *Norfolk Ferry.*

The other train ferry service between Dover and Dunkerque was introduced by the Southern Railway in 1936. This is a service for both passengers and goods and is operated by day and night sailings. The day service is predominantly for cargo but the night service, in addition to freight in wagons, also conveys passengers in sleeping cars. Of the four vessels on this service two, the s.s. *Hampton Ferry* and s.s. *Shepperton Ferry,* fly the British flag and are manned by British crews; the others, s.s.

Photograph : British Railways.

Stern view of m.v. Suffolk Ferry (Harwich-Zeebrugge Train Ferry service)

Twickenham Ferry and m.v. *St. Germain,* fly the French flag and carry French crews.

The design of these ferries and the elaborate shore terminals which have to be provided are worthy of special mention. The main deck of a train ferry is laid out with four railway tracks capable of holding upwards of 40 freight wagons; in fact, it resembles a marshalling yard in miniature. To achieve the object of throughout rail conveyance the stern of the ferry is so designed as to permit of a continuous rail connection with the shore. The shore terminal is in the form of a bridge which is raised or lowered according to the state of the tide, thus enabling the rail tracks on the bridge to be adjusted to the level of the rail tracks on the ferry, the actual connection being made by a link span which secures the ship to the terminal. The arrangement is somewhat different at Dover as, on account of a tidal range of some 18 1/2 feet (compared with 12 feet at Harwich) and a heavy swell which is often experienced, it has been necessary to construct an enclosed dock for the ferries in which the water is adjusted to the required berthing level. Something similar is in use at both Dunkerque and Zeebrugge where a lock in the docks system ensures that only minor variations in water level have to be taken into consideration. The actual operation of loading and unloading the ferries is simplicity itself; a shunting engine merely performs the movements associated with any railway yard except that the deck of the ferry is the « yard ». The ease with which the operation can be carried out can be gauged from the fact that a fully loaded train ferry can be unloaded inside half-an-hour.

There are obvious advantages in such a means of transport, particularly from the trader's point of view. In the first place he saves on packing, as the traffic can be loaded direct into ferry wagons at the sending point and delivered to destination without any handling whatsoever — a most desirable feature. For the same reason, pilferage is reduced to a minimum as, except for when the contents of the wagon are examined by H. M. Customs, the wagon can be locked for the throughout journey. Risk of damage is also considerably lessened, as there is no question of loading into or unloading from ships' holds. It is easy to imagine the types of traffic which would benefit from such a method of transport : soft fruit loaded in refrigerator wagons in Italy conveyed direct to London without handling, frozen poultry for the Xmas market, heavy and bulky equipment such as electrical transformers, and circus animals and equipment.

The ferries on the Dover-Dunkerque service are equipped to carry passengers as well as cargo. A passenger can occupy his berth in a sleeping car at Victoria Station, London, and travel undisturbed by rail and sea to Paris, Customs and immigration requirements being carried out at destination. This is a facility much appreciated by the travelling public, particularly in the winter. These vessels, in addition to carrying upwards of 12 sleeping cars and a number of freight wagons, also have cabin accommodation and public rooms for the use of passengers not travelling

in sleeping cars. A number of these passengers accompany their motor-cars on the ferry as there is an ample garage on the upper deck and cars are also carried on the train deck.

Motor-car carriers.

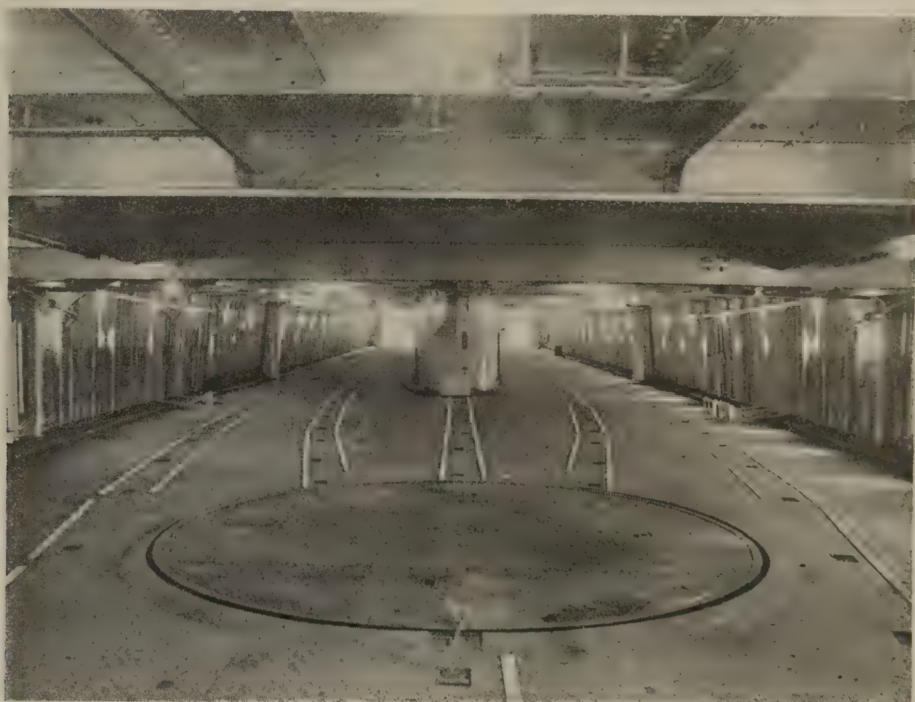
Another specialised form of sea transport which British Railways have developed is the conveyance of accompanied motor-cars. That there is a demand for such facilities is evident from the figures quoted earlier in this article — approximately 115 000 motor-cars to the Continent and Channel Islands in the year 1951 — the highest number ever recorded. The Southern Railway's first vessel for the carriage of motor-cars was the s.s. *Autocarrier,* and this was followed by the conversion of the passenger ship s.s. *Dinard* into a motor-car carrier with accommodation for 70 vehicles. The London Midland & Scottish Railway also built a car carrier — the m.v. *Princess Victoria.* The first vessel of this name was sunk by a mine during the war and her successor entered the Stranraer-Larne service in 1947. In addition to accompanied cars, she conveyed lorries and trailers, and during the past few years a considerable quantity of milk in wheeled tankers has passed from Northern Ireland to this country. The loss

Photograph : British Railways.

Harwich Train Ferry Terminal.

of this vessel with so many lives at the end of January this year is a tragedy which is still fresh in the public mind.

With the great increase in popularity of the touring holiday on the Continent it soon became evident that the existing facilities for the conveyance of accompanied cars were quite inadequate. It was decided, therefore, to order a vessel specially constructed for the accompanied motor-car traffic, to run between Dover and Boulogne. This vessel, the s.s. *Lord Warden,* which has now been in service for nearly a year, has accommodation for 120 motor-cars and upwards of 1 000 passengers. Almost the whole of the main deck of this ship is laid out as a garage, and steel doors are provided at the stern to allow cars to be driven directly on board over loading ramps. At the forward end of the main deck is a turntable enabling cars to be switched round and returned along one side of the garage ready to drive off, thus adopting the « first-on, first-off » principle. The passenger accommodation has a full range of public rooms and private cabins.



Photograph : British Railways.

Car deck of s.s. *Lord Warden* (Dover-Boulogne motor-car service).

It will be appreciated, of course, that the efficient operation of these car car-

riers necessitates the provision of suitable shore terminals in the same way as special terminals are required for the train ferries. The terminal for the motor-car carrier must, in effect, be a continuation of the road access so that the owner merely has to drive his car into what is a garage for the sea crossing. A terminal of this type is now in use at Boulogne and it is hoped that the special car terminal at Dover will be ready for use by this summer. The facilities at Dover are most modern in conception and will ensure smooth passage of owner and car through Customs and Immigration.

The transport of motor-cars by air between this country and the Continent has been an accomplished fact for some years and it therefore behoves British Railways to take every step within their power to give the best possible service by sea for accompanied motor-cars. The introduction of the s.s. *Lord Warden* on the short-sea route and the provision of car terminals at the ports is an indication that they are fully alive to this.

Traffic.

The marine services of British Railways make an important contribution to the British Transport exchequer. The most important of these maritime activities, as well as the most remunerative, are the passenger services and every effort is made to ensure that suitable tonnage is available to meet the demand, particularly during the summer months. Some of the recent acquisitions to the fleet, such as the *Amsterdam, Normannia* and *Cambria* are comparable in size and comfort with many ocean-going passenger ships, and in these days of ever-growing competition by air transport it is sound policy that every consideration should be given to the comfort and well-being of the passenger.

The ships of the Harwich-Hook of Holland night service convey upwards of a quarter of a million passengers in a year. Although in the summer months many of these travellers are holiday makers, the route caters largely for the business man, who is able to leave London in the evening and, after a comfortable night's crossing, arrives in Holland early the following morning without having lost any valuable time in travelling. This is a service which has long been accepted as the natural route to Holland and Germany and which is able to hold it's own with air competition. Considerable quantities of perishable cargo are also carried by this service.

On the short-sea routes from Dover, Folkestone and Newhaven, well over 1 1/2 million passengers are carried in a year. These routes are so essentially « gateways » to the Continent that it is not possible to bring them within the narrow definition of either a business man's service or a tourist service. They cater for all classes of passengers from the city merchant or the « couturier » travelling by the « Golden Arrow » service to Paris to the carefree, happy band of youths bound for a climbing holiday in the Tirol. To them all the sea crossing is a means to an end; an essential link between these tiny islands and the vast panorama of the continent of Europe.

On the West coast of England the services to Ireland and Ulster via Holyhead-

Dun Laoghaire, Heysham-Belfast, Stranraer-Larne and Fishguard-Rosslare provide essential means of communication between a highly industrialised country on the one hand and a largely agricultural community on the other. The 1 442 000 passengers who travelled to and fro between these two islands in the year 1951 are representative of every class of society — the Englishman travelling to Ireland to sell his agricultural machinery : the Irishman to this country to find a market for his livestock : the holidaymaker seeking the quiet and beauty of the Irish countryside and the thousands of Irishmen employed in this country returning to their homeland for a few days' respite, at August Bank Holiday and the New Year. These services, together with those maintained by subsidiaries of Coast Lines, carry the bulk of the passenger traffic between England and Ireland.

Two of the services operated by British Railways which cater largely for the holidaymaker are those from Southampton and Weymouth to the Channel Islands. Probably 85 % of the passengers crossing by these routes are bound for a holiday in one or other of the islands and, as a consequence, the bulk of the traffic passes during the summer months of July, August and September. It is at the weekends during these months there is the greatest demand on the available fleet of ships, and many extra sailings are made. In the year 1951, some 340 000 passengers travelled by these two services.

Although the passenger traffic carried by British Railways shipping services is the most remunerative, the freight traffic is of great value and importance. On the Continental and Channel Islands services, 1 177.000 tons of cargo were carried in 1951, while on the Irish services 509 000 tons cargo and 163 000 head of livestock were conveyed. These figures are quite impressive when it is realised that much of the freight traffic is of a specialised or perishable nature, running into many millions of pounds in value. The majority of the passenger ships convey a certain quantity of cargo and this is usually perishable and highly-rated traffic requiring quick transit. The bulk of the freight traffic is, however, carried in the cargo ships and many of these operate on the same routes as the passenger ships. Typical of these are the cargo services between Folkestone-Calais, Newhaven-Dieppe, Southampton-Channel Islands, Weymouth-Channel Islands and Heysham-Belfast. Other cargo routes on which there are no equivalent passenger services are Holyhead-Dublin (the passenger service runs to Dun Laoghaire), Harwich-Antwerp, Harwich-Rotterdam and Harwich-Zeebrugge (train ferry).

It is impossible to give details of all the traffics carried by these cargo services but mention might be made of a few. Vast quantities of early potatoes and tomatoes are carried from the Channel Islands, cattle and dairy produce from Ireland and fruit and machinery from European countries. A considerable volume of mixed freight traffic is conveyed by the fleet of 14 ships (mostly cargo vessels) of the Associated Humber Lines, in which British Railways have a major interest. Their services operate between Humber ports and Denmark,

Germany, Holland, France and Belgium. During the year 1951 close on half-a-million tons of cargo were carried by these Associated Humber Lines ships.

The traffic carried by the Dover and Harwich train ferry services ranges from soft fruit and poultry to heavy machinery such as electrical transformers. Prior to the coming into force of the import restrictions it was nothing unusual for extra ferry services to be run during July, and August fully loaded with fruit from Italy and France. During the few weeks before Xmas many refrigerator wagons containing poultry were despatched from countries as far away as Hungary, destined for Leadenhall Market, London. Some years before the war the equipment for a complete power station was loaded into ferry wagons at Manchester and shipped via the Harwich-Zeebrugge train ferry service to Hungary. On the passenger side, the Dover-Dunkerque train ferries convey large numbers of road coaches with their accompanying passengers, destined for a fortnight's tour of the Continent.

Ports.

Many of the ports from which the ships operate come under the control of the Railway Executive. They are generally known as « packet » ports, a name which originated in the days when the Post Office first entrusted to the railways the carriage of mails and parcels by certain of their cross-channel services. Typical of these are Harwich, Folkestone, Holyhead and Fishguard, all of which are comparatively small ports dependent for their prosperity on the railway shipping services.

In a number of cases the development of these ports involved the railway companies in the expenditure of considerable sums of money. The port of Harwich, although having a fine natural harbour, was not really suitable for cross-channel services until the Great Eastern Railway, in 1883, created what is known as Parkeston Quay. To do this, considerable reclamation work had to be carried out and entirely self-contained docks provided. The quay has been extended and improved during recent years and to-day berths are available for upwards of nine vessels. The train ferries work from a special terminal at Harwich, which is about 1 1/2 miles from Parkeston Quay. Dover is another port which has been improved beyond all recognition since it's early days as a « packet » port, and the shore facilities provided by the Southern Railway Company probably make it the best equipped cross-channel port in the country.

Fishguard and Holyhead are two other ports where considerable expenditure was incurred by the former railway companies in providing facilities for cross-channel services. Not all the ports from which the railway ships operate are owned by British Railways. Dover is controlled by the Dover Harbour Board, but such shore facilities as cranes, offices, etc., are provided by the Railway Executive. Weymouth is much the same, the port being controlled by the Weymouth Corporation but British Railways provide the cranes and rail facilities.

Southampton and Hull are owned by the British Transport Commission, who have delegated the responsibility for the

working of the ports to the Docks & Inland Waterways Executive. There is, of course, close liaison between the Railway and Docks Executive at such places.

It will be appreciated that, in addition to the actual quay, a very heavy capital cost is incurred in providing cranes, warehouses, Customs bonds, offices and railway facilities, all of which are a charge against the cross-channel services.

It is a tribute to the faith and foresight of the early railway companies who embarked on this heavy initial capital expenditure that the marine services of British Railways to-day play such an important part in the maritime activities of this country.

Design of ships.

The task of the designer of a cross-channel passenger ship is an unenviable one, for he has to meet the requirements of a multitude of Ministry rules and regulations and at the same time produce a vessel which will satisfy the demands and limitations of the service for which she is intended.

The construction of any ship, passenger or cargo, must primarily be carried out within the framework of the Ministry of Transport rules, which cover such things as watertight subdivision, life saving appliances, fire precautions, freeboard, etc. Within this framework the cross-channel ship has to be designed

Photograph : British Railways.
m.v. *Hibernia* (Holyhead-Dun Laoghaire service).

for the particular service, with limitations on length and beam and with a capacity to carry so many passengers and a certain quantity of cargo at a pre-defined speed and draught. For example, no vessel exceeding approximately 330 feet in length can, at present, enter Jersey Harbour, and the maximum draught of any vessel on the Newhaven service is 11 feet.

There are a host of other things to be taken into consideration. What type of machinery shall be installed — turbine or diesel? What is to be the proportion of first to third class accommodation? What shall be the seating accommodation in the restaurant? What space in the ship is to be set aside for the crew's accommodation? The list is almost endless but the final product of the shipbuilding yard is a tribute to the combined skill of the planning staff of the marine department of the railways and the shipbuilders.

It is not only during the construction of a vessel that the surveyors of the Ministry of Transport keep a careful check on the work being done. When the ship is delivered and goes into service these surveyors ensure that, in all respects, she is maintained to the very high standard required of the Ministry of Transport. A passenger vessel is issued with what is known as a Passenger Certificate, and each year she has to undergo a survey by Ministry of Transport surveyors who verify that the ship is maintained in accordance with the regulations and is thus entitled to a Passenger Certificate. No passenger ship can proceed to sea without such a certificate. It is interesting to note that a passenger ship, within the meaning of these regulations, is a vessel carrying more than 12 passengers. That is why so many cargo ships have passenger accommodation for up to 12 persons only. In additon to this Passenger Certificate the vessels are (provided they meet with the requirements) issued with a Loadline Certificate and a Wireless Telegraphy Certificate.

It is clear from this that the cross-channel ships must be built and maintained to an extremely high standard. If any proof is needed of the care with which these vessels are constructed and maintained throughout their life, it is to be found in the fact that all British Railways passenger ships are being built and maintained to Lloyd's Classification, which provides a double and independent check on every phase of construction and maintenance. To anyone even remotely connected with shipping, « A. 1. at Lloyd's » is synonymous of all that is first class in ship construction and maintenance.

Technical developments.

In the field of technical developments the railways have always been well to the fore and this is particularly so in marine engineering. It is not, perhaps, generally realised that they were the pioneers in the adoption of steam turbines in passenger ships as well as of water tube boilers and geared turbines in cross-channel ships. The s.s. *King Edward,* built in 1901, and until just recently engaged on the Clyde services, was the first commercial passenger ship fitted with steam turbines. A trip in her

down the Clyde from Bridge Wharf, Glasgow, was just as smooth after 50 years' running as when she first surprised the marine engineering world with her effortless performances at the beginning of the century.

senger service, are fitted with diesel engines and the m.v. *Norfolk Ferry* and m.v. *Suffolk Ferry,* on the Harwich-Zeebrugge train ferry service, and m.v. *Winchester,* on the Southampton-Channel Islands run, all have diesel engines.

Photograph : British Railways.

m.v. *Winchester* (Southampton-Channel Islands cargo service).

In more recent years they have demonstrated the possibility of marine diesel engines for both passenger and cargo ships of the cross-channel type, in spite of the supremacy for many years of first the steam reciprocating engine and later the turbine engine. The m.v. *Hibernia* and m.v. *Cambria,* operating on the Holyhead-Dun Laoghaire pas-

An interesting and successful innovation has been the adoption of diesel-engined screw-propelled ships on the Portsmouth-Ryde ferry service, and the seven new vessels now building for the Clyde estuary services will also be diesel-powered.

Interesting as these developments are, it does not follow that the diesel type

of engine is necessarily being accepted as standard practice in the cross-channel ships of British Railways, as the s.s. *Amsterdam* and s.s. *Maid of Orleans* delivered two or three years back, and the recent additions to the fleet, the s.s. *Normannia* and s.s. *Lord Warden,* are all powered by steam turbines.

While the initial capital cost of the diesel engine is higher than that of the turbine, this is offset by the more economical performance of the diesel, as the fuel consumption is considerably less and it can be started up shortly before departure and shut down immediately on arrival. On the other hand, the diesel engineer usually has a higher rate of pay than his opposite number on turbines, and the diesel engine is apt to take up more height in the ship than the turbine. There are undoubtedly many schools of thought on the subject of turbines v. diesels, and it will be interesting to watch developments over the next few years.

In other spheres of technical advancement the railways have shown no less activity. As far back as 1932, the Southern Railway experimented with stabilisers and fitted the device in the s.s. *Isle of Sark.* This was followed some years later by the installation of an improved type of stabiliser in the s.s. *Falaise,* and since then the apparatus has been fitted in five other vessels, *Invicta, Maid of Orleans, Normannia, Cambria* and *Hibernia.* A further ship, the motor-car carrier s.s. *Lord Warden,* is shortly to be fitted with a stabiliser.

The device consists of a pair of retractable fins which project from each side of the ship under the water-line, opposing the rolling of the ship. They are worked by electro-hydraulic machinery and are automatically controlled by a small gyroscope. The effect of the stabiliser is to minimise the rolling of the ship, thus adding to the comfort of the passengers. Experience has shown that the performance of the apparatus at sea has been entirely satisfactory and there is not much doubt that many more railway cross-channel ships will be fitted with stabilisers. How vast an improvement on the ordinary fixed bilge keel, which is fitted to nearly all ships afloat.

One of the greatest advances in the navigation of ships in fog has been made possible by the development of radar, an invention that came out of the last war. By means of short waves transmitted from the apparatus and reflected back to the ship it is possible for the navigating officer on the bridge to be given a picture of conditions surrounding his ship, particularly the movement of all vessels within the range of the radar. Just how useful this knowledge can be will be apparent to anyone who has had any experience with travel by sea. Instead of having to anchor for several hours within a few miles of port, it is often now possible for vessels fitted with radar to find their way through quite thick fog and arrive at their destination with little delay. The saving in ship operating costs must more than offset the initial capital cost of the radar installation.

The advantages to be derived from radar have long been appreciated by British Railways, with the result that all their passenger and cargo cross-channel ships are now fitted with radar sets. Various types are in use in order to gain

experience of the individual sets, some being purchased outright and others being rented.

It is probably true to say that the installation of radar in ships of the cross-channel trade is more desirable than in deep sea vessels. Two of the essential and basic requirements of cross-channel ships are regularity and punctuality, as the sea crossing is, in effect, a link between the railway systems of this and other countries, where delay to a boat train caused by failure of a ship to arrive on time can affect connecting rail services in many parts of the Continent. Radar has done much to ensure better time-keeping on these services in conditions of bad visibility, and for that reason alone the cost of installing it is justified.

Photograph : British Railways.

s.s. *Invicta* (Dover-Calais « Golden Arrow » service).

Marine staff.

The intensive cross-channel services operated throughout the year, involving such a high degree of regularity and punctuality, can only be maintained by ships which are kept in perfect running order. That there have been so very few breakdowns in service is a tribute to the constant care and attention manifested by the marine workshop staff and the masters, officers and ratings who man the ships. The majority of these vessels are run at high speeds, varying from 18 to 24 knots, and on a 7 days-a-week

service there is little room for neglect in the maintenance of hull and machinery.

The British Railways marine staff afloat number some 600 officers and 2 700 ratings (this includes staff on coastal water services), and there are 1 800 marine workshop staff engaged in the maintenance and overhaul of the fleet. In addition, of course, there are the administrative and clerical staff and the stevedoring staff in the docks.

The marine staff afloat are, for the most part, under National Maritime Board conditions of service. There are, of course, various local arrangements at the ports to meet special conditions of service, but the basis of employment of the officers and ratings is much the same as other seafarers in outside shipping companies. There is not much doubt but that the cross-channel services of British Railways are an attraction to many foreign-going officers and ratings, who see in them an opportunity to spend more time at home. A number of men have started their sea-going life as boys in a railway cross-channel ship, left the railway service to go deep-sea to get their certificates, and then returned to the railway service as officers of a cross-channel ship. There are, of course, many more cases where boys have followed the family tradition of entering and remaining in the railway cross-channel services.

The staff of the marine workshops undertake the running, maintenance and overhaul of the fleet. Their busy period is, of course, during the winter months, when all vessels have to go through survey and re-fit.

Inter-changeability of ships.

With the merger, in 1948, of the fleets of the four railway companies, consequent upon nationalisation, it has been possible, within limits, to bring about a more economical employment of the various units by the transfer of ships from one route to another. Typical of such transfers have been the employment of a Harwich ship on one of the Southampton services during the summer, a Fishguard vessel to Weymouth to provide relief for the heavy seasonal traffic to the Channel Islands, and a cargo vessel from Southampton to Harwich to cover annual overhauls and boiler cleaning. There are, however, certain considerations which limit the scope for such transfers. Each service has its special characteristics and these differ widely from route to route. It follows, therefore, that the individual ships are designed first and foremost to suit those characteristics and the accommodation thus provided would not necessarily be suitable for the requirements of other services. To take an example to illustrate this point.

On the short-sea services from Dover and Folkestone the vessels are designed to carry upwards of 1 400 passengers, but as the crossing is in daylight and of short duration there is no need to provide any sleeping accommodation whatsoever. On the Harwich-Hook of Holland service, however, the ships are designed to provide the maximum of sleeping accommodation for a night crossing of some 8 hours. This is an entirely different type of service where the maximum number of passengers carried does not exceed

675. This may be an extreme case but it does serve to illustrate the limited scope there is for the transfer of ships from one route to another. A service more comparable with the Harwich-Hook of Holland route is the Southampton-St. Malo service, which is a night crossing of some 9 hours, and it is here that there has been an interchange of ships, the s.s. *Duke of York* having been transferred from Harwich to the Southampton-St. Malo run during the busy summer months. Further limiting factors in interchangeability are the navigational requirements of the ports and the dimensions and draughts of the ships. For example, no vessel exceeding approximately 330 feet in length can at present enter Jersey Harbour, and this would preclude the *Arnhem* (377 feet) or *Cambria* (397 feet) from operating on any service to the island. Equally the s.s. *Amsterdam* (15′2 1/2″ loaded draught) could not be used on the Dover services, where the maximum draught is just under 13 feet.

Photograph : British Railways.
Lounge of s.s. *Arnhem* (Harwich-Hook of Holland service).

Apart from these physical considerations there is another aspect which precludes the free interchange of ships. With few exceptions, the peak period of

traffic coincides on all routes in the summer months, when every available vessel is put into service. It is at these peak periods that some services require additional tonnage but the absence of spare units prohibits any effective interchangeability. With the cost of shipbuilding at it's present high level it is not an economical proposition to provide additional ships merely for use during a few months each year.

It will be appreciated that, although it is a difficult matter and uneconomical to alter existing ships to make them freely interchangeable, it should be possible, in designing new tonnage, to make some provision in the plans to ensure that the ship could, if necessary, be transferred for use on other services.

Future prospects.

What is the outlook for the future of cross-channel shipping services ? Will they continue to enjoy an era of prosperity ? These are questions which, at the present time, are not easy to answer with any degree of assurance. The first element of uncertainty is the restriction on currency for foreign travel. This has undoubtedly had a marked influence on the cross-channel traffic to the Continent and while it lasts it is bound to have a dampening effect on foreign travel. Similarly, the import restrictions are responsible for a diminution in the inwards carryings of cargo. It is surely not unreasonable to hope, however, that these restrictions will be lifted in the not too distant future.

The second, and perhaps more disquietening element, is the development of air transport for passengers and cars. Travel by air has long been accepted by the public and the constant and rapid growth of this means of transport cannot be ignored by the surface operator. The air operator is able to offer his clients one big advantage — that of speed. Coupled with this is his ability to carry his passenger in comfort and give that little extra personal attention which means so much to the modern traveller. Customs and Immigration examination are equally necessary when travelling by air, but the comparatively small numbers of passengers who present themselves at the airport controls are usually dealt with in a much shorter space of time than the average boatload of passengers, who may number up to 1 500. As against these advantages there are probably still quite a number of people who view travel by air with some trepidation and are content to take longer on their journey. With the rapid advance in the technique of aeronautics there is not much doubt but that in a few years' time these fears will be dispelled. On the other hand, there are very many people who, on account of sea sickness, equally view with some dismay the prospect of a sea crossing, be it only by one of the short cross-channel routes. Here again, air travel is at some advantage as there is nowhere near the tendency to air sickness.

In recent months the air companies have made considerable reductions in their passenger fares and freight rates for cars in an endeavour to increase their carryings, and it should be a clear indication to the surface operators that this is a direct challenge for the custom of

the would-be traveller. What can the operators of the cross-channel shipping services do to meet this air competition ?

They cannot possibly hope to compete with the speed of air transport. It is in the matter of comfort that the surface operator must strive to improve his facilities. The average passenger likes to feel that his well-being and comfort on any journey is very much the consideration of the transport officials and staff. The personal touch cannot, perhaps, be so much in evidence in a cross-channel ship as in an aircraft, as there are so many more passengers travelling, but every step should be taken to provide the very best service for the passenger. To anticipate a person's requirements is far better than to wait to be asked.

The boat train is the passenger's first introduction to the cross-channel service, and care should be taken to see that the stock is kept quite clean, an ample supply of hot water is available for washing, together with towels and soap. Restaurant facilities should be ample and the food tastefully prepared and well served. At the port and in the ship there should be the same consideration for detail — aid and advice promptly and willingly given. It is, of course, most desirable that the ships and associated shore faci-

Photograph : British Railways.

Restaurant of s.s. *Lord Warden.*

lities should be up-to-date but, with shipbuilding costs at their present high level, it is not possible to have modern ships on all services.

Consideration might also be given to the inclusion of meals and tips in the fares, the introduction of special tourist rates and an extensive publicity campaign.

Bearing in mind the many difficulties encountered by the railway companies and their successors, British Railways, largely as a result of the ravages of the war years, it can fairly be claimed that good progress has been made in providing new tonnage to keep abreast with present-day requirements. It is only by pursuing a progressive shipping policy that British Railways can hope to maintain their present strong position in the cross-channel trade.

This article is a brief outline of the cross-channel services operated by British Railways, but their shipping activities are not confined to this type of service. In addition to the 75 cross-channel ships, British Railways have a fleet of 62 craft engaged on coastal water and esturial services around this island. Typical of these services are the Isle of Wight ferries, the Clyde services, Humber ferries and Tilbury-Gravesend ferries. During the year 1951 these services conveyed over 13 million passengers as well as 110 000 tons cargo, figures which are indicative of the importance to the community of such services.

[621 .392 (494) & 624 (494)]

A new railway bridge constructed in welded steel,

by M. Frei,

Chief Engineer to Messrs Wartmann & Co., Brougg (Switzerland).

(L'Ossature Métallique, No., 5, May 1952.) (*)

The old line from Hauenstein, the first link Olten-Basle of the Federal Railways (C. F. F.) crosses the Aar at Olten by a bridge of arches built of wrought-iron. In order to be able to increase the load on this structure, the Tannwald Bridge, it was replaced in 1951 by a new bridge. For the time being, only that part of the bridge supporting the track on the down-stream side has been completed. The old bridge was designed for two tracks carried by 5 parallel arches. Built in 1854, by the well known engineer A. Riggenbach, it was the first railway bridge in the world to be constructed with wrought-iron arches. This was a masterpiece in its day, both with respect to its attractive appearance as also on account of the method of carrying out the structural details.

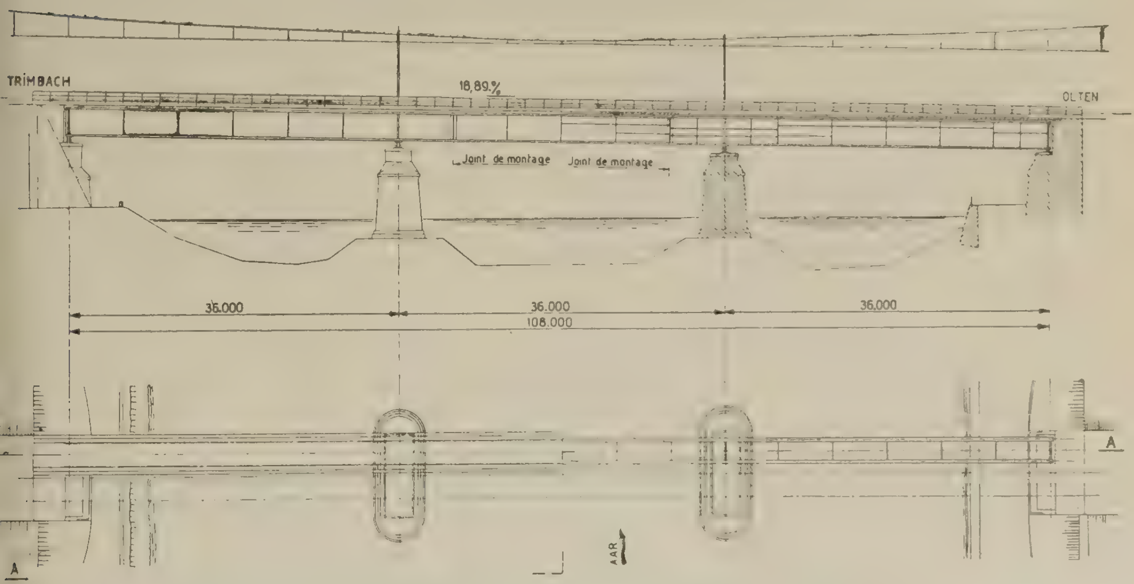


Fig. 1. — Elevation and plan of the new welded metal bridge, spanning the Aar at Olten (Switzerland).

In the autumn of 1949, public tenders were invited whereby undertakings were allowed to submit their own proposals, apart from the scheme put forward by the C. F. F. The work was allotted to Wart-

(*) Blocks are lent by *L'Ossature Métallique*.

mann & Co. Ltd. of Brougg, based on their experiments and on their most recent data obtained in the use of welded structures.

The piers, like the abutments, were welded webs and parallel flanges form a complete unit with the reinforced concrete ballast box. Transverse trellis ties spaced 6 m (19′ 8″) apart ensure stiffness in the

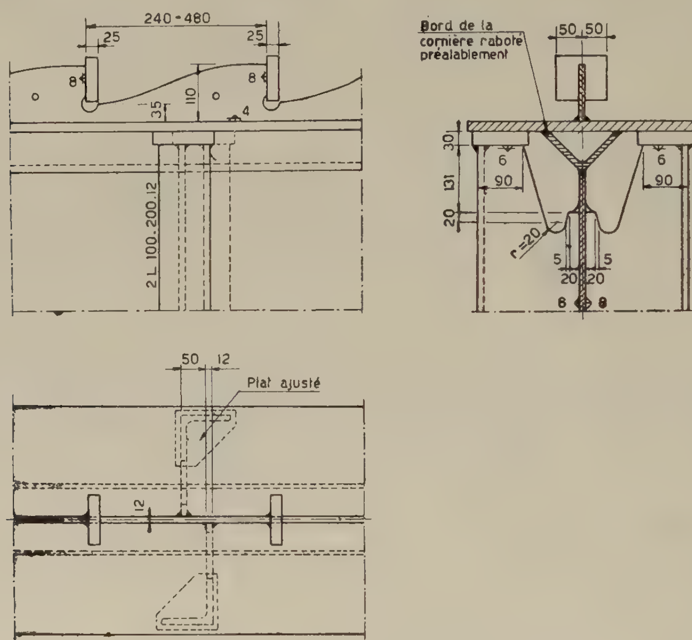


Fig. 2. — Details of construction of the upper girder with pin tooth rack.

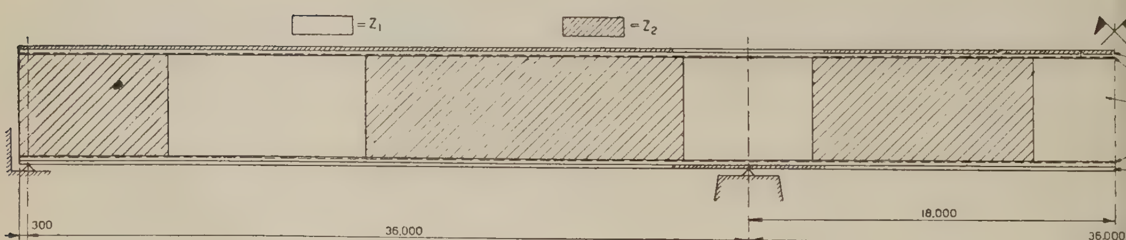


Fig. 3. — Distribution of Z_1 and Z_2 steels.
1. Top flange. — 2. Angle-iron bar. — 3. Web plate. — 4. Bottom flange.

retained intact for the new bridge of which the main girders consist of three continuous plate-girders spans, each of 36 m (118′).

The two main girders having solid gaps. The bridge was calculated to accommodate a train made up of three locomotives and an indefinite number of tip wagons, according to article 3[1] of the Federal Order of the 14th May 1935. The permis-

sible tensional stresses laid down were those of the standard specifications. S. I. A. No. 112 of October 1946, for steel structures, and of the Federal Order of 14th May 1935, relative to concrete structures.

The main girders and the reinforced concrete box do not work together except for the loads due to the trains, to the ballast and to the tracks. The actual weight of the metallic structure and of the concrete box is entirely supported by the steel girders. In order to reduce, in the concrete, the high tensile stresses due to the negative moments in the region of the two supports at the centre, and to diminish the danger of cracking of the box, the two supports of the bridge were lowered each by 10 cm (about 4 in.) after the concrete had set. In order to reduce the cracking due to contraction, the deck was concreted by sections 6 m long, and the joints at the sections only filled up after hardening had taken place.

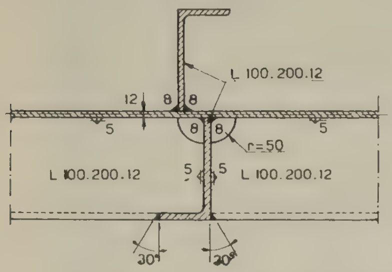


Fig. 4. — Detail of junction for stiffeners.

Moreover, the concrete forming the box was kept wet for a long period. In order to resist the negative moments in the neighbourhood of the piers and to strengthen the main girders, longitudinal stiffeners were fitted in the concrete box. For additional safeguard, the steel girders were designed so that in the event of the combined work of the girders-plate not acting vertically on the bearings of the piers, the stresses in the steel should not exceed the apparent elastic limit. As regards the stresses and the construction of the main girders, consideration was given to the various new points of view arising from the character of a structure in welded steel. Thus, in examining the problem of a welded steel bridge, the choice of quality of the steel plays a much more important part than in the case of a riveted structure.

In the design of a riveted steel bridge a material carefully tried out under previously agreed conditions, largely fulfils the designer's requirements. In this case, we are mostly dealing with a tension which is unidimensional. On the other hand, in a welded structure we have to take account of stresses in several dimensions. The fissuration known to us so far in welded work arises mostly without showing any déformation, having its origin in the zones hardened by the heat generated in the thermal process of welding. The tensions in several dimensions thus produced have made the material brittle. If its plasticity sufficed for an unidimensional stress, this will no longer be the case under the new conditions. So we are faced with the following problem : to produce for welded work of importance, a basic material having a high capacity for producing work under plastic conditions and retaining this property after welding has taken place at relatively low temperatures.

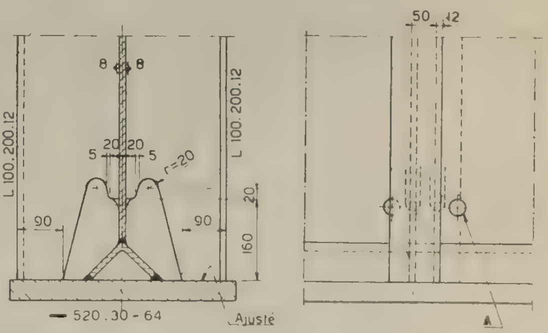


Fig. 5. — Cross section through the lower girder.

A : Stress relief holes.

The contractor knew, that for choosing the steel the tests indicated in the order of

the 14th May 1935 as well as all similar rules practised abroad for studying brittleness, the tendency to hardening and its plastic behaviour were inadequate to meet the requirements of the case. The firm Wartmann & Co. Ltd. had on this account decided, in agreement with the Consulting Engineer M. SCHNADT, whom they had already consulted when the scheme was originally discussed, to use special steels for this bridge, steels which had been tested with the help of methods developed by this engineer himself. These methods employed a series of resilience tests for different diameters of the notch and enabled the engineers to study the plastic behaviour of a steel under varying tensile stresses and for several dimensions, as also at different temperatures.

Since not all the parts of the bridge are neither fully stressed nor are they all stressed in the same manner, steels of different quality were chosen. For the zones subject to high tensile stresses, a Z_1 steel was used, having the following properties :

Basic (Thomas) Steel, normalised, killed by the addition of aluminium, $C \leqslant 0.13\ \%$, $S \leqslant 0.05\ \%$, $P \leqslant 0.05\ \%$.

In addition, this steel shows certain minimum values of M. SCHNADT's tests allowing for good plastic behaviour, both for a temperature of minus 15 degrees as also after ageing. As to the parts only slightly stressed in tension and those which are in compression, a Z_2 steel was used with the same limiting values for C, S and P. Since in these zones, there is no point where the tensile stress is very marked, the metal may be slightly brittle and more subject to ageing. Z_2 is a steel killed by the addition of aluminium, not normalised, and of which the limit values of M. Schnadt's tests in respect to ageing, are slightly lower than those accepted for Z_1. Moreover Z_1 and Z_2

Fig. 6. — View of the old bridge across the Aar, built in 1854.

fulfil the conditions laid down by the standardisation scheme for 1946. For all the secondary parts, e. g. braces, stiffeners, etc. a standard steel has been used corresponding to the scheme of 1946.

The following firms were ordered to deliver the rolled sections and plates :

S. A. Ougrée Marihaye;

Société des Hauts Fourneaux et Aciéries de Differdange;

S. A. Arbed, Belval.

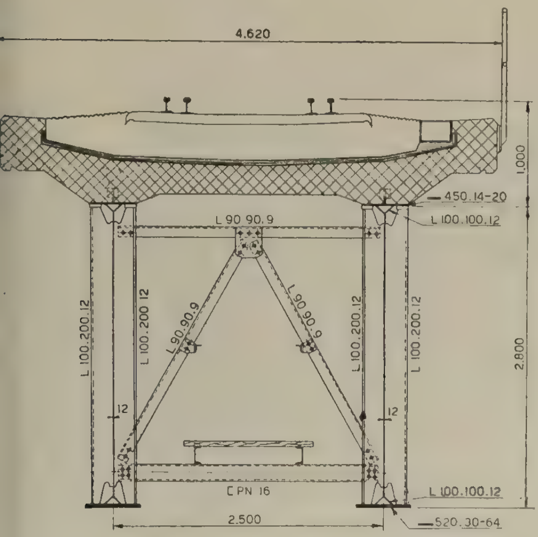


Fig. 7. — Cross section of the span.

These firms applied themselves successfully to the production of steels of the very high quality requisite in the construction of the bridge, and in this way have contributed to an appreciable degree to the success of this work.

Steels which have not been killed are very dissimilar both chemically due to local increases in the percentage of sulphur (S) and phosphorus (P), as well as mechanically, and they exhibit important variations in their plastic behaviour. The zones where segregation takes place are particularly harmful when they occur in the parts subject to the effect of the welds, as they intensify strongly the fragility of the welds. It is above all the first welds in joints of sections of large flat plates which are most seriously menaced.

The same considerations hold for the choice of electrodes. The electrodes « Univers W. » of the Oerlikon factory were being used, they were basic electrodes becoming slightly fragile after ageing has taken place, as happens at a temperature of minus 15 degrees C. As the first welds are often more brittle than those heated to red heat by the weld itself and will be found in still worse condition, it is particularly important to control their tendency to developing cracks.

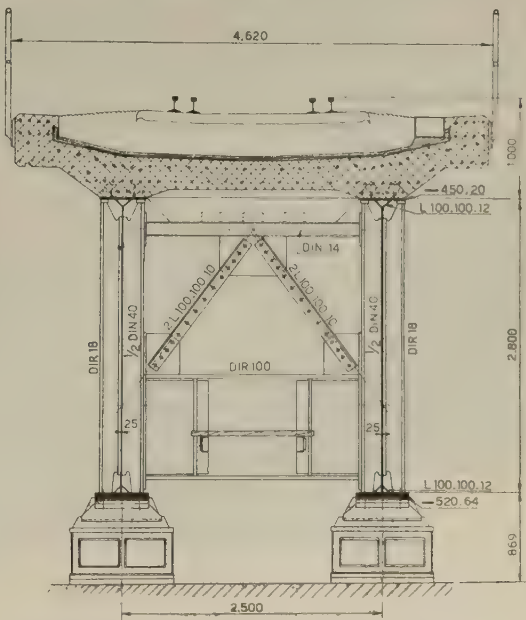


Fig. 8. — Cross section at the piers.

In addition to choosing special steels, efforts have been made to improve the plastic behaviour of the work by suitable design, taking into account the following instructions :

1. To avoid variations in sections and the irregularities of surface caused by abrupt changes, by joints, by transverse

welds, by starting longitudinal welds, by recesses due to fusion of the metal, etc.

2. To lowering the tensile stresses in several dimensions by displacement of certain welds. To restrict the volume of welds to a strict minimum by a minutely detailed fixed programme of the welding work.

3. Where high tensile stresses appear, to provide openings for relief and plasticity and thus to secure a more favourable distribution of the tensile stresses.

This led to new details in the design.

The connection between the steel girders and the ferro-concrete box is ensured by using rigid pins. The operations carried out so far as also the scheme laid down by the C. F. F. utilise for these pins, rolled steel sections welded to the upper flange at given intervals. This method of working causes marked disturbances in the distribution of tensile stresses in said flanges, which indicates a particularly unfavourable reaction in the zone under tension and to variable tensile stresses above the pier bearings. The transverse welds and the starting

Fig. 9. — General view of the new welded bridge over the Aar at Olten.
The quietly restrained design of the work is in perfect harmony with the surrounding landscape.

points of the welds for each pin give rise to local centres of stress by their zones of fusion, all of which seriously lower the resistance of the bridge to fracture. The solution adopted for the Tannwald Bridge avoids these defects, the small plates serving as pins being welded up to form a sort of rack. This rack is mounted on the upper part by continuous longitudinal welds. The connection between the concrete box and the steel girders has been still further

improved by additional transverse iron straps fixed to the rack.

The scheme proposed provides for irons having a « Wulsteisen », central bulb or rib for making connections between the flanges and the webs of the girders. But trials made with these arrangements are not giving satisfaction. Due to the low height of the ribs or bulbs and to their relatively great width at the base, this part of the iron does not get sufficiently worked (rolled) in course of production. As a result, the brittleness at this point becomes as great as in an iron without rib having the same thickness as that of the full section with a rib. The result is that the welds of the booms are located in the zones which are metallurgically most unfavourable and most brittle. In addition to this the rolling tolerances of $\pm$ 3 mm (1/8″) for the height of the rib is too great for good design as regards the weld between the web and the flange. Moreover, there is the difficulty of supply since every time these sections are required a relatively large quantity have to be bought.

The solution arrived at for the junction between the web and the flanges is an angle-iron of 100.100.12. This method is patented by the firm Dörnen of Dortmund-Derne, and had already been much used in Germany. It has the following advantages :

— Gradual change from the flange to the web.

— Slight tension due to lateral narrowing of the flange.

— Better stressing of the upper member by the concrete box, the flange being supported at two points.

— Better distribution of the tensions in the spacing, the elasticity of the section of

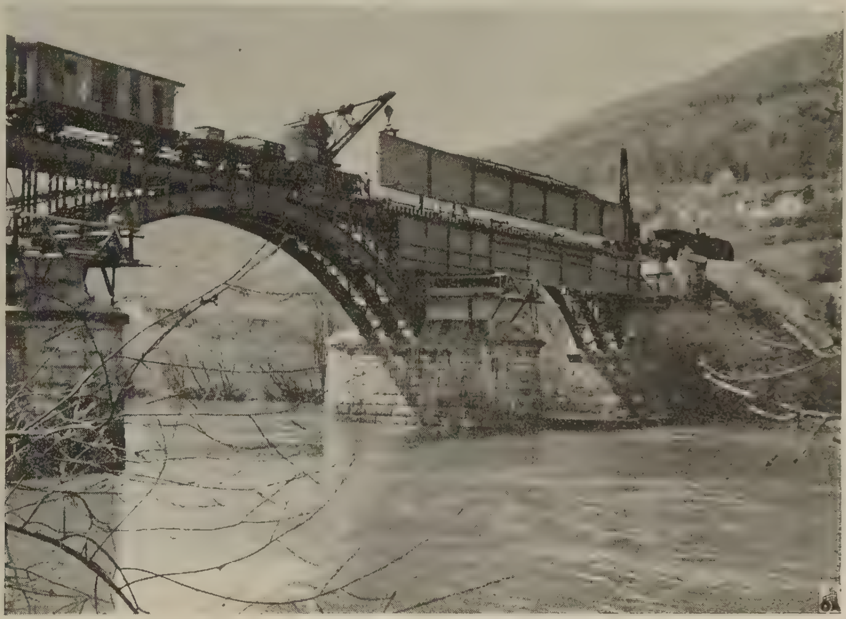


Fig. 10. — The bridge over the Aar at Olten, view taken during erection.

angle-iron, tending to diminish the stresses, due to vertical narrowing of the space at right angles to the flange.

— Diminution of the height of the web, which resists the tendency to buckling.

Before starting erection in the workshop, a series of tests was made to determine the best form to give to the welds between angle-irons and the flanges of the girders, and to determine the most favourable space to allow between the two for accommodating the welds. Accordingly the angle-irons were planed and placed in position. Trials which were made at the EMPA [1] gave, for the junction welds, angle-iron to girder flange in the longitudinal sense, an initial strength of 21 to 24 kg/mm² (12.70 to 15.24 tons per sq. in.). From the point of view of strength, this joint is therefore perfect.

As regards the details on the main girder, reference will be made to the plans. Here, we only give the principal dimensions. The upper girder flanges have a width of 450 mm (1′ 5 11/16″) and thickness of 14 mm (35/64″) between the bearings and of 20 mm (25/32″) in the vicinity of the bearings. The lower flanges, on the other hand, have a width of 450 mm and a thickness of 34 to 64 mm (1 11/32″ to 2 33/64″). The butt joints for the flanges are welded with X-form or U-form welds, and the change from a wide flat-plate of extra thickness to another of lesser thickness is effected by means of a taper of 1 in 20. The web of the girder has a height of 2 640 mm (8′ 8″) and thickness of 12 mm (15/32″) or 25 mm (63/64″) above the central bearings. The welds for joints in the flanges and in the web were planed down so as not to show any obstruction. Main stiffeners spaced

Fig. 11. — Welding the girders with the help of rotating jigs.

(1) EMPA, abbreviation of *Eidgenössische Materialprüfungs- und Versuchsanstalt* (Federal Laboratory for testing materials).

6 m apart and intermediate and horizontal and vertical stiffeners strengthen the web against buckling. For this, 100.200.12 angle-irons were used everywhere. Special note will be taken of the pieces cut from the extremities of the stiffeners. Their shape is governed by the desire to secure pliability at the welds joining the stiffeners to the web, in order to lessen the tensional stresses perpendicular to the plane of the girder and, thereby, to diminish the danger of fracture. A further improvement in the local stresses in the zone subject to tension was sought by providing relief holes in the web of the girder on either side of the starting points of the welds. The vertical stiffeners are attached to the web by continuous fillet welds, well fitted against the lower part and pressed tightly against the upper part by fitting pieces. The starting points of the welds on the stiffeners were extended and ground to shape. In order to transmit directly to the web the pressure on the bearings, fitting pieces were placed in the angles of the booms.

Erection in the shops presents no difficulty. Web, flanges and angle-irons for the structure, were assembled in parts ready for erection on benches specially built for the purpose. Allowance was provided for possible deformations, due to shrinkage caused by the welds in the positions arranged for. Assembly and final welds on parts of the finished girders took place on a structure arranged for rotation on its own axis, and consisting of nine rings rigidly interconnected, in order to resist the torque, and capable of supporting the components of a girder 42 m (137′ 9 1/2″) long. Before erection in the workshop was started, all the welders working on this order had to pass an examination. The welds were inspected and verified as the work progressed, by X-ray examination. The joints

Fig. 12. — Main girders, ready for transport to the site.

in the plates forming the flanges, the butt joints in the web, and the longitudinal welds were subjected to a particularly minute examination. All the welds were made in an order of rotation, previously determined, in order to reduce to a minimum the tensional stresses due to contraction and to strain caused by the welds.

The two main girders were delivered on site in 3 parts, about 42, 24 and 42 m in length (137′ 9 1/2″, 78′ 9″ and 137′ 9 1/2″). All the joints made in the workshops are welded, the four joints for erection and also the connections between the girders are riveted.

The bearings were made of improved

Fig. 13. — Part of the superstructure being unloaded in position.

cast steel, according to the C. F. F. standards, Art. 10, 1946.

The deck of the bridge is of high quality concrete, reinforced with standard mild steel.

There was some difficulty with transport of the parts erected in the shops, having a length of 42 m, height of 2.90 m (9′ 6 1/4″).

As regards the transport from Brougg to Olten, only the flat cars N 74031 and N 74032 could be used. They could each carry two of the girders at the same time, and they travelled as a special train as far as Olten. There with the help of two cranes on wagons of 14 and 15 tons, it was necessary to unload them and store them temporarily. A horizontal temporary stiffener bar was connected to the upper flange, to prevent them from turning over.

The C. F. F. removed the two arches downstream of the old two track bridge and on this account during the construction, traffic was maintained on the remaining track, supported by the three other main girders, which were consolidated by means of supplementary stiffeners.

The erection of the parts of the new bridge took place between the passing of trains. On account of lack of space available and of the weakness of the old bridge, it was necessary to arrange details of erection with great circumspection. Each separate part of a girder was moved in turn onto the remaining portion of the old bridge, with the help of two special « dyplories », then with the two cranes on wagons, the parts were dropped onto the sleepers just alongside the vehicles. After this the two « dyplories » were pushed one against the other, and then it was possible to place the cranes in the best position for lowering the girder parts onto temporary bearings, whence they were moved to their final position.

By the construction of the Tannwald bridge, which for the time being is the largest welded steel railway bridge for standard gauge in Switzerland, the C. F. F. have contributed appreciably to the development of welded steel structures.

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OFFICIAL INFORMATION

ISSUED BY THE

PERMANENT COMMISSION

OF THE

International Railway Congress Association.

Meeting of the Permanent Commission, held on the 17th January, 1953.

The Permanent Commission of the International Railway Congress Association met at 3 p.m. on the 17th January 1953, in the Belgian National Railways Headquaters Offices, in Brussels.

* * *

Before the opening of the meeting, Mr. DELORY, *Past President*, made a speech in which he said that having reached the age limit, he had retired from his position of General Manager of the Belgian National Railways. Offering his resignation as President of the Association, he thanked the Permanent Commission for the marks of esteem he received during the years of his presidency and expressed his best wishes for the future work of the Association.

Mr. GOURSAT, *Vice-President*, then opened the meeting and, prejudging of the agreement of the Assembly on the proposal of modification of the Rules and Regulations, in question further on, drafted at the morning's meeting of the Executive Committee, he proposed to appoint Mr. DELORY, *Honorary President* of the Association.

— This proposal was unanimously approved.

Mr. GOURSAT, *Vice-President*, then went to the first item on the agenda and obtained the approval by the Assembly of the Minutes of the Meeting held in Stockholm on the 9th June 1952.

* * *

Mr. GHILAIN, *Vice-President and General Secretary*, informed the Meeting of the changes which occurred in the Permanent Commission since the last session. He also gave particulars of the steps taken to fill the seat's vacancies.

Mr. Alfonso PEÑA BŒUF, *President of the Administrative Council of the R.E.N.F.E.*, was elected Member of the Permanent Commission, to replace Mr. BENJUMEA Y BURIN, COUNT OF GUADALHORCE, deceased.

Furthermore, the name of the personality, who will replace Dr. Sayed Abdel WAHID, also deceased, will be given in the near future by the Egyptian State Railways.

In accordance with the decision taken at the Stockholm meeting on the 9th June 1952, to allocate four mandates to Germany, the following personalities were elected Members of the Permanent Commission :

Prof. Dr.-Ing. FROHNE, Vorsitzer des Vorstandes der Deutschen Bundesbahn;

Dr. SCHELP, Mitglied des Vorstandes der Deutschen Bundesbahn;

Mr. M. JACOBSHAGEN, Ministerialdirektor, Leiter der Betriebsabteilung der Hauptverwaltung der Deutschen Bundesbahn;

Mr. A. BRILL, Dipl. Ing., Ministerialdirektor, Leiter der Maschinentechnischen- und Beschaffungsplanungsabteilung der Hauptverwaltung der Deutschen Bundesbahn.

Mr. GHILAIN then recalled that Mr. DELORY, reached by the age limit, has retired from his position of General Manager of the Belgian National Railways, and the latter have proposed Mr. M. DE VOS, new General Manager of the S.N.C.B. to take over Mr. DELORY's mandate. On the other hand, the Belgian National Light Railways Company (S.N.C.V.) has presented Mr. HOENS, new General Manager, in replacement of Mr. DE VOS.

— These proposals were adopted.

— *The complete list of Members of the Permanent Commission is given in Appendix I.*

Then the Assembly elected the new *President of the Association* replacing Mr. DELORY.

Following a proposal made by Mr. GOURSAT, Mr. Marcel DE VOS, now General Manager of the Belgian National Railways, was unanimously elected President of the *International Railway Congress Association.*

Mr. DE VOS then assumed the Presidency. He expressed his thanks to the Assembly for this mark of confidence and assured that he will do his best to deserve it.

Mr. GHILAIN recalled that the London Congress will take place from the 19th to the 26th May, 1954, in the premises of the « Church House », near the British Parliament. He gave particulars on the organization of the technical meetings which were arranged for the final drafting of the questionnaires relative to the agenda of the Congress and mentioned that these questionnaires were distributed to the Railway Administrations during the fourth quarter of 1952. He added that during 1953 steps would be taken to prepare the membership's card and to obtain travelling facilities in favour of the delegates and of the accompanying persons.

Mr. J.L. HARRINGTON, Chief Officer (Administration) to the Railway Executive and *President of the Local Organizing Commission*, then reported on the preparatory arrangements made for the London Congress and on the provisional programme of the Session.

He gave some further information about the organization of the Congress, the technical visits, excursions, and also the reservation of accommodation for the participants. The travelling facilities granted in Great Britain will be the same as those of previous Congresses.

Mr. GHILAIN submitted to the approval of the Meeting the allocation of the

mandates of Presidents of Section between the different countries :

1st Section.

WAY AND WORKS :

Great Britain.

2nd Section.

LOCOMOTIVES AND ROLLING STOCK :

France.

3rd Section.

WORKING :

Germany.

4th Section.

GENERAL :

Italy.

5th Section.

LIGHT RAILWAYS AND COLONIAL RAILWAYS :

India.

The *Vice-Presidents of Section* will be chosen in order that the countries, who have not a Presidency, will have a Vice-Presidency.

— These proposals were adopted.

* * *

The GENERAL SECRETARY informed the Assembly of a request, made by the South African Railways, to add a question dealing with « Accidents on the railways » to the agenda, already fixed, of the London Congress.

After an exchange of views, it was decided, as the London agenda is already crowded, to put this question on the agenda of the next Enlarged Meeting of the Permanent Commission.

* * *

The accounts of receipts and expenditure for the financial year 1952 was approved by the Assembly, as well as the budget for 1953. Having regard to the present financial situation, the Meeting decided to fix the amount of the variable contribution for 1953, to 0.26 Gold franc per kilometre, i.e. the amount already approved by the Permanent Commission at its Meeting of the 5th March 1951, held in London.

* * *

Then the Meeting heard the report on the changes in memberships since the 1952 session.

The International Railway Congress Association include at present 34 Governments, 8 Organizations and 102 Railway Administrations, with a total mileage of 451 000 kilometres (280 000 miles).

* * *

After examining certain items relative to the activities of the Association since the last session, Mr. GHILAIN, *General Secretary*, submitted to the Meeting a proposal of modification of article 6 of the Rules and Regulations, approved by the Executive Committee at its meeting held in the morning, on the 17th January 1953.

This proposal concerns essentially the appointment of *Members of honour* of

the Permanent Commission and of *honorary Presidents*, in order to regularise certain nominations made previously. The proposed additions are the following:

— *At the end of the first sentence of article 6 :* « ... of members of honour and of honorary Presidents ».

— *After the second paragraph of article 6 :*

« The members of honour are chosen amongst the elected members of the Permanent Commission, when they have been serving permanently on the Permanent Commission at least during twenty years.

« In exceptional cases, the Congress will have the right to confer the title of member of honour to former members who, though not fulfilling the above conditions, will have rendered exceptional services to the Association. »

— *After the fourth paragraph of article 6 :*

« The past Presidents of the Association may be appointed honorary Presidents.

« The mandates of honorary Presidents and of Members of honour are conferred for life. »

— The Permanent Commission approved, whitout comments, the principle of the proposed modifications.

Mr. GHILAIN recalled that according to article 21 of the Rules and Regulations, this proposal must be submitted for discussion to the London Congress, after report of a special committee. Following the approval by the Congress, the proposed modification will only be finally adopted after a written ballot, closed six months after the closure of the Session of the Congress (art. 22 of the Rules and Regulations).

— The Meeting then was closed.

List of Members of the Permanent Commission

OF THE

INTERNATIONAL RAILWAY CONGRESS ASSOCIATION

(17th JANUARY 1953)

President :

M. **De Vos** (3), directeur général de la Société Nationale des Chemins de fer belges; 19, rue du Beau-Site, Bruxelles.

Vice-presidents :

Goursat (1), directeur de la Région du Nord de la Société Nationale des Chemins de fer français; 18, rue de Dunkerque, Paris (Xe);

P. **Ghilain** (2), directeur du Service du Matériel et des Achats de la Société Nationale des Chemins de fer belges; 19, rue du Beau-Site, Bruxelles.

Members of the Executive Committee :

Dorges (3), inspecteur général des Ponts et Chaussées, secrétaire général aux Travaux publics, directeur général des Chemins de fer et des Transports au Ministère des Travaux publics et des Transports; 244, boulevard Saint-Germain, Paris;

Lord **Hurcomb** (1), Chairman of the British Transport Commission; 55, Broadway, London, S. W. 1;

Sir Gilmour **Jenkins** (2), Secretary to Minister of Transport (Great-Britain); Berkeley Square House, Berkeley Square, London, W. 1.

Ex-presidents of session, members ex-officio :

Ing. G. **di Raimondo,** directeur général des Chemins de fer de l'Etat italien; Rome;

Ibrahim Fahmy **Kerim**; Le Caire;

Dr W. **Meile,** ancien président de la Direction générale des Chemins de fer fédéraux suisses; Brügglerweg, 11, Berne.

Members :

Abdel Rahman el Sayed **Ammar** (3), sous-secrétaire d'Etat au Ministère des Communications d'Egypte; Le Caire;

Armand (3), directeur général de la Société Nationale des Chemins de fer français; 88, rue St-Lazare, Paris (IXe);

F. Ch. **Badhwar** (3), Chairman, Railway Board, Ministry of Railways, Government of India; New Delhi;

V. M. **Barrington-Ward** (2), member of the Railway Executive (British Railways); 222, Marylebone Road, London, N. W. 1.;

J. **Benstead** (1), Deputy Chairman of the British Transport Commission; 55, Broadway, London, S.W. 1;

Besnard (2), chef de service adjoint au directeur général des Chemins de fer et des Transports, Ministère des Travaux publics et des Transports; 244, boulevard Saint-Germain, Paris;

David **Blee** (3), member of the Railway Executive (British Railways); 222, Marylebone Road, London, N. W. 1;

J. **Bouciqué** (3), directeur du Service de la Voie de la Société Nationale des Chemins de fer belges; 17, rue de Louvain, Bruxelles;

Ch. **Boyaux** (2), directeur général adjoint de la Société Nationale des Chemins de fer français; 88, rue Saint-Lazare, Paris (IXe);

Dipl.-Ing. A. **Brill** (3), Ministerialdirektor, Leiter der Maschinentechnischen- und Beschaffungsplanungsabteilung der Hauptverwaltung der Deutschen Bundesbahn; Bieberer Strasse, 59, Offenbach (Main);

R. **Claudon** (3), inspecteur général des Ponts et Chaussées, vice-président du Conseil d'administration de la Société Nationale des Chemins de fer français; 88, rue Saint-Lazare, Paris (IXe);

M. W. **Clement** (1), Chairman of the Board Pennsylvania Railroad Company; Broad Street Station Building, 1617, Pennsylvania Boulevard, Philadelphia, 4, Pa.;

Dr R. **Cottier** (1), directeur de l'Office Central des Transports Internationaux par Chemins de fer; Berne;

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(1) Retires at the 16th session.
(2) Retires at the 17th session.
(3) Retires at the 18th session.

T. C. **Courtney** (3), Chairman of the Coras Iompair Eireann, Kingsbridge Station, Dublin;

M. **Crèm** (1), directeur du Service de l'Exploitation de la Société Nationale des Chemins de fer belges; 17, rue de Louvain, Bruxelles;

Csanadi (1), Directeur Général des Chemins de fer de l'Etat hongrois; Budapest;

Dr Ing. A. **Cuttica** (3), chef du Service du Matériel et de la Traction des Chemins de fer de l'Etat italien; Florence;

Dargeou (3), directeur du Service central du Mouvement de la Société Nationale des Chemins de fer français; 8, rue de Londres, Paris, (IXe);

J. **de Aguinaga** (2), Director General de Ferrocarriles, Tranvias y Trasportes por carretera; Madrid;

F. Q. **den Hollander** (1), président des Chemins de fer néerlandais, S. A.; Utrecht;

Ing. V. **Dešic** (2), professeur à la Faculté Technique de Belgrade, Conseiller permanent du Ministère des Chemins de fer de la République fédérative populaire yougoslave; Belgrade;

Dias Trigo (1), directeur des Services d'Exploitation et du Matériel de la Direction des Transports terrestres au Ministère des Travaux publics et des Communications du Portugal; Lisbonne;

M. **Devos**, (already named);

Ing. G. **di Raimondo** (already named);

Dorges (already named);

J. **Elliot** (1), Chairman of the Railway Executive (British Railways); 222, Marylebone Road, London, N. W. 1;

Hassan **Fahmy** (3), directeur général adjoint de l'Administration des Chemins de fer, Télégraphes et Téléphones de l'Etat égyptien; Le Caire;

W. T. **Farici** (3), president, Association of American Railroads; Transportation Building, Washington, 6. D. C.;

Dr Ing. F. **Fazio** (1), conseiller d'administration aux Chemins de fer de l'Etat italien; Rome;

Prof. Dr.-Ing. E. **Frohne** (1), Vorsitzer des Vorstandes der Deutschen Bundesbahn; Bieberer Strasse, 59, Offenbach (Main);

J. M. **Garcia-Lomas** (2), directeur du Réseau National des Chemins de fer espagnols; Madrid;

P. **Ghilain** (already named);

Goursat (already named);

Dr. **Gschwind** (2), président de la Direction générale des Chemins de fer fédéraux suisses; Berne;

Ranald J. **Harvey** (3), consulting engineer to the Government of New Zealand (Railways); 34, Victoria Street, Westminster, London, S. W. 1;

R. **Hoens** (1), directeur général de la Société Nationale belge des Chemins de fer vicinaux; 14, rue de la Science, Bruxelles;

Lord **Hurcomb** (already named);

Dr **Huyberechts** (2), directeur général adjoint de la Société Nationale des Chemins de fer belges; 17, rue de Louvain, Bruxelles;

M. **Jacobshagen** (2), Ministerialdirektor, Leiter der Betriebsabteilung der Hauptverwaltung der Deutschen Bundesbahn; Bieberer Strasse, 59, Offenbach (Main);

Sir Gilmour **Jenkins** (already named);

Ing. Ch. **Kalitzov** (2), chef de la Section du mouvement des Chemins de fer et des Ports de l'Etat bulgare; Sofia;

Ibrahim Fahmy **Kerim** (already named);

A. **Kriz** (3), ingénieur, conseiller supérieur de Section au Ministère des Communications de la République tchécoslovaque; Prague;

R. **Kunz** (2), directeur de l'Office fédéral des transports; Berne;

Dr N. **Laloni** (1), vice-directeur général des Chemins de fer de l'Etat italien; Rome;

Dr Ing. G. **Lasz** (3), conseiller d'administration aux Chemins de fer de l'Etat italien; Rome;

F. L. **Lehtinen** (3), Directeur Général adjoint des Chemins de fer de l'Etat de Finlande; Helsinki;

Lemaire (2), directeur à la Société Nationale des Chemins de fer français; 88, rue Saint-Lazare, Paris (IXe).

R. **Lévi** (2), directeur des Installations fixes de la Société Nationale des Chemins de fer français; 42, rue de Châteaudun, Paris;

G. **Lindenberg** (3), advisory engineer to the High Commissioner for the Union of South Africa; South Africa House, Trafalgar Square, London, W. C. 2;

Ing. R. **Luna** (2), directeur général des Chemins de fer de l'Etat argentin; Buenos-Aires;

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(1) Retires at the 16th session.
(2) Retires at the 17th session.
(3) Retires at the 18th session.

M. **Malderez** (2), secrétaire général du Ministère des Communications de Belgique; 17*a*, rue de la Loi, Bruxelles;

Ing. F. **Marin** (3), vice-directeur général des Chemins de fer de l'Etat italien; Rome;

Ing. P. P. **Martin** (1), directeur national de la Planification et de la Coordination du Ministère des Transports de la République d'Argentine; Buenos-Aires;

Dr W. **Meile** (already named);

P. **Nolet de Brauwere** (3), Secrétaire Général de la Société Nationale des Chemins de fer belges; 17, rue de Louvain, Bruxelles;

J. H. **Nuelle** (3), president, Delaware & Hudson Railroad Corporation; 32, Nassau Street, New York City;

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A. **Peña Bœuf** (3), Président du Conseil d'Administration du Réseau National des Chemins de fer espagnols; Madrid;

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